DMX

Networked AoIP Broadcast Console

Installation Guide and User Manual

AUDIOARTS ENGINEERING

Manufactured by Wheatstone Corporation

Publication Information

Trademarks

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For technical support, including on-site service, general product training, repair and parts, contact Wheatstone through our webpage (www.wheatstone.com), through email at techsupport@wheatstone.com, or by phone (+01 252-638-7000).

Manual Revisions

A = Initial release, October 2017

B = technical corrections, IP Navigator additions, operational clarifications, October 2017

C = Appendix A on networking multiple consoles added; some technical corrections; consolidated software app info into chapter 3, July 2018

D = Added info on a new feature: saving/loading EQ Configuration files (DMX Surface Setup, build 1.0.29 and later), September 2018

D.1 = Added info about saving two Studio EXT selections, October 2018

D.2 = Changed exclamation point graphic to display properly in a PDF, October 2018

E = Clarified note on using mono signals on the Razor along with other minor changes and clarifications. January 2019

F = Updated manual with Audioarts Engineering logo and new DMX Setup & support for WNIP Navigator, January 2020

G = Updated Gigabit Ethernet switch model and information on changing the Mix Engine's IP address and Device number, March 2020
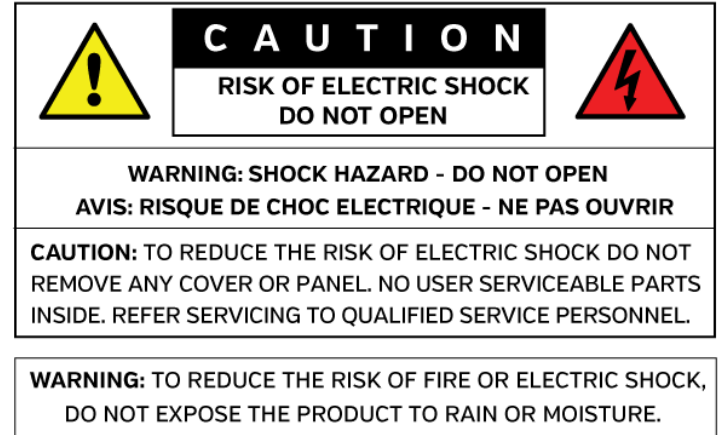
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Safety Instructions

1. **Read All Instructions.** Read all safety and operating instructions before operating the product.

2. **Retain All Instructions.** Retain all safety and operating instructions for future reference.

3. **Heed All Warnings.** You must adhere to all warnings on the product and those listed in the operating instructions.

4. **Follow All Instructions.** Follow all operating and product usage instructions.

5. **Heat.** This product must be situated away from any heat sources such as radiators, heat registers, stoves, or other products (including power amplifiers) that produce heat.

6. **Ventilation.** Slots and openings in the product are for ventilation. They ensure reliable operation of the product and keep it from overheating. Do not block or cover these openings during operation. Do not place this product into a rack unless proper ventilation is provided and the manufacturer's recommended installation procedures are followed.

7. **Water and Moisture.** Do not use this product near water such as a bathtub, wash bowl, kitchen sink, or laundry tub, in a wet basement, or near a swimming pool or the like.

8. **Attachments.** Do not use any attachments not recommended by the product manufacturer as they may cause hazards.

9. **Power Sources.** You must operate this product using the type of power source indicated on the marking label and in the installation instructions. If you are not sure of the type of power supplied to your facility, consult your local power company.

10. **Grounding and Polarization.** This product is equipped with a polarized AC plug with integral safety ground pin. Do not defeat the safety ground in any manner.

11. **Power Cord Protection.** Power supply cords must be routed so that they are not likely to be walked on nor pinched by items placed upon or against them. Pay particular attention to the cords at AC wall plugs and convenience receptacles, and at the point where the cord plugs into the product.

12. **Lightning.** For added protection for this product, unplug it from the AC wall outlet during a lightning storm or when it is left unattended and unused for long periods of time. This will prevent damage to the product due to lightning and power line surges.

13. **Overloading.** Do not overload AC wall outlets, extension cords, or integral convenience outlets as this can result in a fire or electric shock hazard.

14. **Object and Liquid Entry.** Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short out parts, which could result in a fire or electric shock. Never spill liquid of any kind on the product.

15. **Accessories.** Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult and serious damage to the product. Any mounting of the product must follow manufacturer's installation instructions.

16. **Product and Cart Combination.** Move this product with care. Quick stops, excessive force, and uneven surfaces may cause the product and the cart combination to overturn.

17. **Servicing.** Refer all servicing to qualified servicing personnel.

18. **Damage Requiring Service.** Unplug this product from the wall AC outlet and refer servicing to qualified service personnel under the following conditions:
    a. When the AC cord or plug is damaged.
    b. If liquid has been spilled or objects have fallen into the product.
    c. If the product has been exposed to rain or water.
    d. If the product does not operate normally (following operating instructions).
    e. If the product has been dropped or damaged in any way.
    f. When the product exhibits a distinct change in performance. This indicates a need for service.

19. **Replacement Parts.** When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or that have the same characteristics as the original parts. Unauthorized substitutions may result in fire, electric shock, or other hazards.

20. **Safety Check.** Upon completion of any repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.

21. **Cleaning.** Do not use liquid or aerosol cleaners. Use only a damp cloth for cleaning.

Hazard and Warning Label Identification

CAUTION

**RISK OF ELECTRIC SHOCK
DO NOT OPEN**

**WARNING: SHOCK HAZARD - DO NOT OPEN
AVIS: RISQUE DE CHOC ELECTRIQUE - NE PAS OUVRIR**

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK DO NOT REMOVE ANY COVER OR PANEL. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THE PRODUCT TO RAIN OR MOISTURE.

The **Exclamation Point symbol**, within an equilateral triangle, alerts the user to important operating and maintenance (servicing) instructions in product literature and instruction manuals.

The **Lightning Flash With Arrowhead** symbol, within an equilateral triangle, alerts the user to the presence of uninsulated dangerous voltage within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

NOTE: The DMX Family of equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

1 – INTRODUCING THE DMX CONSOLE

Thanks for joining the growing ranks of broadcasters employing Audioarts products designed, manufactured, and supported by Wheatstone Corporation. Throughout our long history we've endeavored to provide the finest quality products, documentation, and support. To obtain the maximum benefit from the DMX console's capabilities, please read through the Introduction, and Chapters 2 and 3, prior to installing the DMX console. For those in a hurry, a **DMX Quick Guide** and a **Mix Engine Hook-up Diagram** (PDF files on the USB flash drive that ships with the console) summarize the console's physical connections, the software, and Surface controls.

The DMX console has these main components:

- **DMX-8 or DMX-16 Surface** – This part is commonly referred to as the "console" since it sits on the countertop and has all board operator controls. Figure 1-1 shows the DMX-8 Surface. Every DMX Surface has these features:

  - **Fader Channels** – There are eight identical fader channels on the DMX-8 and sixteen on the DMX-16. Each fader channel has eight push buttons with LED illumination (channel on, channel off, cue on/off, talkback (TB), and four PGM bus assigns), a color Organic Light Emitting Diode (OLED) display to show channel status, a 100 mm fader, and a rotary Channel Encoder to select the channel source. The Channel Encoders are also used to access three Advanced Channel Features: audio mode, panning, and EQ & Dynamics, any of which can be locked out from board operator access.

  - **Monitor Controls** – The console supports a Control Room and an associated Studio with: CR monitor, CR headphone, Cue, and Studio Monitor level controls; CR and Studio monitor source selectors; timer controls; and four Console Event buttons.

  - **Meter Bridge** – Three stereo LED meters display the levels for PGM 1, PGM 2, and a Switched signal: PGM 3, PGM 4, EXT, and CUE, when enabled. The Meter Bridge also has a four-digit timer, bus overload indicators, and an On-Air (Hot Mic) indicator.

  - **Headphone output** – A board operator headphone amp is included in the DMX Surface with a ¼" TRS jack on the right side of the chassis, in-line with the OLED displays.

Figure 1-1 DMX-8 Surface

Figure 1-2 Mix Engine, front panel

- **Mix Engine** – The 1RU Mix Engine (Figure 1-2) has the audio, logic, and network connections for the DMX console along with the DSP, signal mixing, and AoIP (Audio over IP) interface functions.

The Mix Engine has these main features:

- 5-port Gigabit Ethernet switch, to network the Surface and Engine, along with three other Ethernet devices, like an admin PC, audio playback server, VoxPro PC, Razor I/O Interface, or a main AoIP gigabit switch to network multiple DMX studios together

- Two low-noise mic preamps, with female XLR inputs, each with switchable phantom power and input trim control

- Eight stereo/dual mono inputs (four analog and four AES)

- Four stereo program outputs (analog and AES on each output)

- Four stereo analog outputs for Control Room, Studio, Cue, and operator headphone output for use with an outboard amp

- One 6-port GPIO logic connector

- DC power source for the DMX-8 Surface (the DMX-16 Surface has a separate in-line DC supply)

- **Installation Kit** – The DMX ships with a USB flash drive with PDF documentation files and the installers for Navigator and DMX Surface Setup, the two software apps used configure the DMX. Navigator is a licensed application so a license must be purchased to continue using the app beyond the 30-day demo license which is included with the DMX. Contact Wheatstone support (page 59) to obtain a demo license.

DMX-8 consoles include an IEC AC power cord for the Mix Engine and a DC cable for the Surface. DMX-16 consoles include an in-line DC supply for the Surface and two IEC AC power cords for the Mix Engine and in-line supply. All consoles include a short CAT5 cable to connect the Mix Engine's Ethernet port to Port 5 on the built-in gigabit switch.

DMX OVERVIEW

The DMX console is a compact, self-contained, Audio over Internet Protocol (AoIP) radio broadcast and production console which uses the WheatNet-IP (WNIP) networking convention. Designed for 24/7 operation, the console has two main hardware components: a 1RU rack mount **Mix Engine**, which has all of the console's audio and logic connections along with a built-in 5-port gigabit Ethernet switch; and a tabletop board operator controller called the **Surface** (which most users consider is the "console"). Both Surface and Mix Engine are fully FCC and CE certified.

DMX consoles ship with a default configuration so they can be powered up and used right out of the box. The default settings are changed, to configure the console for use in an on-air studio, production room, newsroom, or other application, using the two Windows PC apps included with the console. Using these software apps is covered in Chapter 3.

Razor I/O Interfaces (1RU, FCC and CE certified) are available to add audio and logic I/O to any DMX console. Razors use RJ45 jacks (StudioHub-compatible) for their eight inputs and eight outputs. There are three I/O styles: all analog I/O plus two mic preamps (**Razor 16A**); all AES I/O (**Razor 16D**); or half analog and half-AES (**Razor 16AD**). Each Razor also has one RJ45 Logic jack with six GPIO ports. A Razor connects to a port on the Mix Engine's gigabit Ethernet switch using a single CAT5e or CAT6 cable of up to 330 feet (100 meters).

The DMX can also be networked with any **WheatNet-IP Blade** to provide additional audio and logic I/O. To network he DMX with a full WNIP System, the configuration of the Mix Engine's built-in Ethernet switch, which is set for stand-alone operation from the factory, must be edited. See Appendix A on the configuration setting which needs to be changed to support networking the DMX with a larger WNIP system.

DMX Surface

The Surface has eight or sixteen audio control channel strips or Fader Channels. Three of these fader channels are shown in Figure 1-3, along with the Monitor Controls which are in two columns of controls. Each fader channel has a large-knob rotary encoder so the board operator can select the audio source for each fader channel. A channel status display, just above the on and off buttons, shows the name of the audio source that's currently "dialed up" on that channel, along with other source and channel status information.

When the channel is off, the channel source can be changed by rotating the channel encoder. This channel display change to show alternate source names available for that channel, with one name highlighted. Rotate the encoder until the desired name is highlighted then tap once, or "click" the rotary encoder to connect the highlighted source to that fader channel. That signal's name is then shown in green in the normal channel display.

Each fader channel can be assigned to any combination of Program buses using the four assignment buttons just below the channel encoder.

Each fader channel has a 100 mm fader for bus level control, plus eight illuminated switches (Off, On, Cue, Talkback (TB), PGM 1–PGM 4). The fader channel controls are identified in Figure 4-2 on page 46.

The Monitor Controls (the two columns of controls at the right end of the Surface) are identified in Figure 4-4 on page 50. The left column has the Control Room controls. The three top buttons select the source (PGM 3, PGM 4, or External) feeding the *Switched Meter*. A large user-set *Soft* button (no default setting) is just above the six Control Room monitor select buttons (PGM 1–PGM 4, EXT 1, EXT 2). These control the audio going to the Control Room monitors and the board operator headphone output. The Spilt Cue button sets how cue is fed to the headphones (whether cue even goes to the headphones is set in the DMX Surface Setup app).

Figure 1-3 Surface Controls

The right column has the four *Event buttons*; two large *Timer control buttons*; a studio monitor source selector (*EXT*); and a large Talk to Studio button (*TB*).

The *CUE/SOURCE*, *CR*, *STUDIO*, and *HDPN* controls are rotary encoders used to control the level of the four dedicated monitor outputs on the Mix Engine. The two Monitor OLED displays show the current levels of those four outputs and their status (a red X over a bar graph icon indicates that output is muted). The *CUE/SOURCE* and *STUDIO* encoders are also used to assign sources to the various EXT buttons. They can also be used to select and take a "wild source" for the CR and Studio monitor outputs, respectively.

All Surface controls are on a single field-replaceable *Control Panel* which connects to an internal host board using one (DMX-8) or two (DMX-16) plug-in ribbon cables. This allows for rapid field replacement, with minimal interruption to operations, in case of spills or other damage to the Surface controls. Because the program audio flows through the Mix Engine and not the Surface—except for the audio going to the side panel-mounted headphone jack, the Surface can be separately powered down from the Mix Engine without affecting program audio.

Meter Bridge

The integrated direct-view Meter Bridge (Figure 1-4) sits above and behind the control panel. It has three stereo LED level meters, a four-digit Timer, and an On-Air indicator. The left meter and middle meters show the Program 1 and Program 2 bus levels, respectively. The right meter is switchable between showing the other two program buses (PGM 3 or PGM 4) or an External signal (EXT) like an off-air tuner. The switched meter can be configured to auto-switch to show the cue levels while cue is active.

The meters normally show both the average and peak levels, but software settings allow them to be changed to show only the average level or only the peak levels, for special functions.
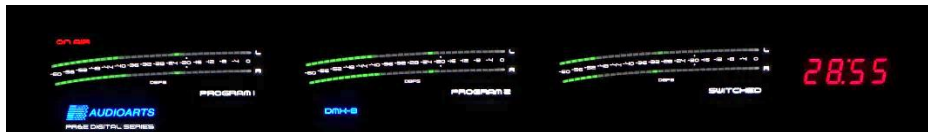

Figure 1-4 DMX Meter Bridge

The four-digit Timer is controlled manually, using the Monitor section *S/S* button (Timer Start/Stop control), or automatically, when the *Auto Timer* button is lit and an audio source, set for Timer Reset (assigned to specific audio signals using the DMX Surface Setup app) is turned on.

Mix Engine

All audio and logic connections are made on the rear of the Mix Engine (Figure 1-5). This 1RU device has a **5-port Gigabit** switch; two high-

quality low-noise **Mic Preamps** (with gain control and 48-volt phantom powering); **Signal Processing** with EQ and dynamics (applied on a fader channel basis); **eight routable audio inputs** (four analog and four AES); **four Program audio outputs** (four analog and four AES outputting the same set of signals); **four dedicated analog outputs** (to feed powered Control Room and Studio monitors, powered cue speakers, and an outboard board operator headphone amp); **six GPIO logic contacts** (each independently set to function as a logic input or logic output) and an **Ethernet** jack to connect the Engine to the built-in 5-Port Gigabit switch.

Figure 1-5 Mix Engine, rear panel

Input and Output Connectors

All audio, logic, and network connections on the Mix Engine and on the optional Razor I/O Interface (Figure 1-6)—other than microphone preamp inputs which have female XLR connectors, use RJ45 connectors and category wiring (CAT5, CAT5e, or CAT6). Figure 2-4 on page 12 has wiring pin outs for the RJ45 connectors used to connect analog audio, digital audio, and logic to/from the DMX console.

Analog and AES wiring conforms to the StudioHub+ convention with two balanced analog, or one AES/EBU (AES3) signal, per RJ45 jack.

The RJ45 Logic jack has six GPIO logic ports plus a +5V and a GND connection which use the WheatNet-IP logic jack wiring format.

Figure 1-6 Razor 16AD Interface, rear panel RJ45 Connector Detail

DMX SPECIFICATIONS

Test Conditions:

➢ FSD = Full Scale Digital, 0 dBFS = +24 dBu analog

➢ 0 dBu corresponds to 0.775 volts RMS—regardless of the circuit impedance, as measured using a 600-ohm circuit.

➢ Noise specs measured using a 22 Hz – 20 kHz bandwidth. A 30k Hz bandwidth increases the noise measurement by 1.7 dB.

Wheatstone reserves the right to change the specifications on the following page without notice or obligation.

Mic Preamp

Source Impedance: 150 – 600 Ω, balanced

Nominal Input Level: -50 dBu

Input Range: -70 to -31 dBu (using trim control to reach nominal level)

Equivalent Input Noise: -131 dBu

Logic GPIO

Six per RJ45 connector: Connection assignments set using **Navigator** (type of logic command and whether it is a logic input or logic output)

Logic Input: Current-limited using internal pull-up. Supports +5 to +12 voltage logic. For a logic low, input voltage must fall below +2.5 volts.

Logic Output: Active low logic which supports +5 to +24 VDC logic, 50 mA nominal, 100 mA max

Analog I/O (Inputs & Outputs: +4 dBu, balanced)

Input Impedance: >10 k Ω, bridging

Optimal Source Impedance: <1 k Ω

Analog In > Analog Out Frequency Response: +0.0, -0.25 dB, 20 Hz to 20 kHz @ +4 dBu

Analog In > Analog Out THD & Noise: <0.0025%, 20 Hz-20 kHz @ +4 dBu

Nominal / Maximum Input Level: +4 dBu / +24 dBu (±18 dB of level gain/trim control available in Navigator)

Output Source Impedance: <10 Ω balanced

Output Load Impedance: 600 Ω optimal

Nominal / Maximum Output Level: +4 dBu / +24 dBu (±18 dB of output level gain/trim control in Navigator)

A > D Conversion: 24-bit resolution

D > A Conversion: 24-bit, advanced Delta-Sigma

Digital I/O (AES/EBU Inputs & Outputs)

Reference Level: -20 dB FSD (equivalent to analog +4 dBu)

Nominal / Maximum Input or Output Level: -20 dB FSD / 0 dB FSD (±18 dB of level gain/trim control available in Navigator)

Digital In > Digital Out Frequency Response: ±0.0 dB, 20 Hz to 20 kHz @ -20 dB FSD

Digital Input > Analog Output THD & Noise: <0.00017%, 20 Hz-20 kHz @ -20 dB FSD

Digital I/O (continued)

Signal Format: AES-3, S/PDIF (inputs only)

AES-3 Input Compliance: 24-bit (uses SRC to support incoming sample rates of 32 – 96 kHz, 16- to 24-bit resolutions)

AES-3 Output Compliance: 24-bit

Output Sample Rate: 44.1 or 48 kHz

Processing Resolution: 24-bit

Surface Dimensions

DMX-08: 4.25" x 17.625" x 17" (H, W, D)

DMX-16: 4.25" x 29.625" x 17" (H, W, D)

Mix Engine Dimensions

A 1RU rack-mounted device:

1.75" x 19.0" x 13.25" (H, W, D)

Razor I/O Interface Dimensions

A 1RU rack-mounted device:

1.75" x 19.0" x 9.25" (H, W, D)

Power Supply

Type: Internal switching supply on the Razor and the Mix Engine, which also powers the DMX-8 control surface; the DMX-16 Surface uses a separate in-line DC power supply

AC input: Detachable IEC cord

AC input: 90-240 VAC, 50/60 Hz

Output: +16 VDC @ 1 amp (PWR OUT jack on Mix Engine)

Output: +16 VDC @ 2.67 amps (DMX-16 Surface in-line supply)

Power Requirements

Mix Engine: <27 watts at 120 VAC / 60 Hz

DMX-08 Surface: <10 watts at 120 VAC / 60 Hz

DMX-16 Surface: <20 watts at 120 VAC / 60 Hz

Razor: <15 watts at 120 VAC / 60 Hz

Environment

Ambient Temperature: Less than 40°C

Cooling: Convection cooled, no fans

WARRANTY STATEMENT

LIMITED WARRANTY BY WHEATSTONE CORPORATION

1. All equipment sold and shipped to final destinations within the USA and its possessions warranted for one (1) full year from the date of purchase against defects in material and workmanship. All equipment sold and shipped to final destinations outside the U.S.A. and its possessions warranted for one (1) full year from the date of purchase against defects in material and workmanship.

All repairs to maintain the unit at original specification will be made at no charge to the original purchaser, except for shipping and insurance costs to be prepaid by the owner to the factory in the event the unit cannot be serviced by an authorized Wheatstone Corporation dealer.

2. This Warranty is subject to the following restrictions and conditions:

a) The owner must have filled out the enclosed Warranty Card and returned it to Wheatstone Corporation; or at the time of servicing the owner must provide proof of purchase from an authorized Wheatstone Corporation distributor or dealer.

b) This Warranty is valid for the original purchaser on the unit. Parts used for replacement are warranted for the remainder of the original warranty period. Repair or replacement is in the discretion of Wheatstone Corporation and is the exclusive remedy hereunder.

c) This Warranty DOES NOT apply to damage or defects resulting from abuse, careless use, misuse, improper installation, electrical spikes or surges, or alteration, repair, or service of the unit or equipment by anyone other than Wheatstone Corporation or its authorized dealer.

d) This Warranty is void if the serial number has been removed, altered or defaced.

e) This Warranty DOES NOT cover loss or damage, direct or indirect, arising out of the use or inability to use this unit or for shipping or transportation to any dealer.

f) Wheatstone Corporation reserves the right to modify or change any unit in whole or in part at any time prior to return delivery in order to incorporate electronic or mechanical improvements deemed appropriate by the Wheatstone Corporation but without incurring any responsibility for modifications or changes of any unit previously delivered or to supply any new equipment in accordance with any earlier specifications.

g) THERE ARE NO OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IF FOR ANY REASON, ANY IMPLIED OR STATUTORY WARRANTY CANNOT BE DISCLAIMED, THEY ARE LIMITED TO THIRTY (30) DAYS FROM THE DATE OF PURCHASE. WHEATSTONE CORPORATION IS NOT RESPONSIBLE FOR ELECTRICAL DAMAGE, LOSS OF USE, INCONVENIENCE, DAMAGE TO OTHER PROPERTY, OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL, WHETHER DIRECT OR INDIRECT, AND WHETHER ARISING IN CONTRACT, TORT, OR OTHERWISE. NO REPRESENTATIVES, DEALERS, OR WHEATSTONE PERSONNEL ARE AUTHORIZED TO MAKE ANY WARRANTIES, REPRESENTATIONS, OR GUARANTIESS OTHER THAN THOSE EXPRESSLY STATED HEREIN.

Attention!

Federal Communications Commission (FCC) Compliance Notice:
Radio Frequency Notice

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

> ⚠ **This is a Class A product. In a domestic environment, this product may cause radio interference, in which case, the user may be required to take appropriate measures.**

This equipment must be installed and wired properly in order to assure compliance with FCC regulations.

Caution! *Any modifications not expressly approved in writing by Wheatstone could void the user's authority to operate this equipment.*

2 – DMX HARDWARE INSTALLATION

Each DMX Surface is 17" (43.2 cm) deep and 4 1/4" (11 cm) tall. The DMX-8 Surface is 17 5/8" (45 cm) wide. The DMX-16 Surface is 29 5/8" (75.3 cm) wide.

The Mix Engine (1RU) mounts within the studio cabinetry near the Surface location. Install at least one 1RU blank panel above the Mix Engine to ensure adequate ventilation. DMX components are convection cooled allowing them to be mounted into any studio, including ones with active microphones, without adding any environmental noise. When locating the DMX Surface and Mix Engine, avoid proximity to devices which may generate electromagnetic fields, such as large power transformers, motors, and audio amps using switching supplies.

LOCATING THE DMX COMPONENTS

The DMX Surface is intended to set on top of the studio furniture countertop with its palm rest between six and twelve inches (15 to 30 cm) from the edge of the countertop (Figure 2-1). This "setback space" allows keyboards and mice, a VoxPro controller, copy, log sheets, etc. to be set in front of the console.

The **Mix Engine** (1RU) is typically rack mounted into a 19" rack located below the countertop. We recommend adding a 1RU vented panel both above and below the Mix Engine for ventilation. Mount the Mix Engine so its rear panel is easily accessible since that's where the DMX audio, logic, and network connections are made.

With a DMX-8 Surface, a **16-foot locking DC cable** (included) connects the DMX Surface to the PWR OUT jack on the back of the Mix Engine. This constrains are far away the Mix Engine can physically be located since the DC cable must not be under strain when connected between the DMX Surface and Mix Engine.

⚠️ **Note:** The in-line DC supply used with the DMX-16 Surface (Wheatstone # 980064) can be used to power a DMX-8 Surface if the Mix Engine must be mounted beyond the reach of the included 16-foot DC cable.

The DMX-16 Surface includes an in-line DC supply with a captive DC cable and detachable IEC AC cord. An isolated AC outlet must be located below the countertop to allow the six-foot DC cable to plug into the Surface and the six-foot AC cord to plug into an AC outlet.

The Surface Ethernet port connects to Port 4 on the Mix Engine's rear panel Ethernet switch using a straight-thru category cable (**customer supplied CAT5e or CAT6 cable**).

The DMX Surface is typically just set onto the countertop since its weight (16 lbs. for DMX-8, 26 lbs. for DMX-16) and four large rubber feet should hold it in place. If the Surface needs to be fastened to the countertop for security reasons, a step-by-step procedure is listed in the section *Fastening the Surface to the Countertop*, on page 11.
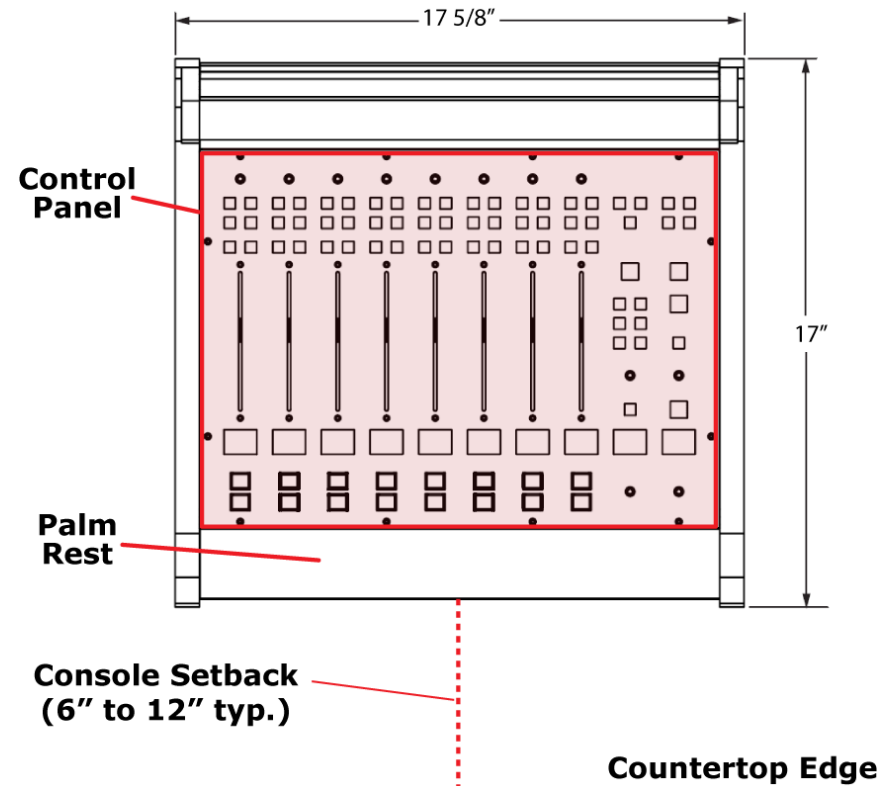

Figure 2-1 DMX-8 Surface, Countertop Positioning

For the cleanest installation, we recommend drilling a one- to two-inch cable access hole through the countertop for the Surface wiring. Only the customer supplied CAT5e / CAT6 cable and the DC power cable connector must pass through this hole, so hole size is not critical. The hole could be sized to match an available hole grommet, or it could be left raw since it'll be covered by the Surface.

Here are the steps to drilling the cable access hole:

1. Position the Surface on the countertop so that the palm rest is parallel to the countertop edge and is setback the desired amount (typically, between six and twelve inches).

2. Use a pencil to mark the countertop at the center of the front edge of the palm rest (for the DMX-8, this is the center line between fader channels 5 and 6, as shown in Figure 2-1).

3. Move the Surface out of the way and mark a point 13" behind the palm rest mark, perpendicular to the countertop edge. This marks where the one- to two-inch cable access hole will be drilled.

4. Drill the cable access hole through the countertop.

Surface Placement & Cable Connections

Before setting the Surface back into position, remove the upper rear cosmetic cover by removing the black #1 Phillips screws. The top of the cover fits into a slot in the Meter Bridge top cover, so it may have to be pulled down slightly to remove it from the slot. When removed, the host control board, with the DC power jack and RJ45 Ethernet jack is revealed.
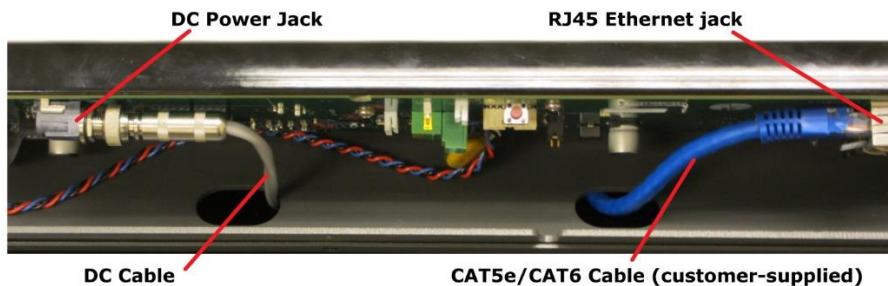
Figure 2-2 Surface rear view (upper rear cover removed)

Route the DC and category cables up through the countertop hole and through the two lower chassis access holes (Figure 2-2). Plug and latch the category cable into the **RJ45 Ethernet** connector. Plug the DC cable into the **DC power jack** tightening its housing onto the threaded jack. Reattach the upper rear cover then set the Surface into position on the countertop.

On a DMX-8 Surface, route both the DC and category cables to the back of the Mix Engine (Figure 2-3). Plug the category cable into **Port 4** on the built-in **ETHERNET** switch. On a DMX-8 Surface plug the DC cable into the **PWR OUT** jack, tightening its housing onto the threaded jack.

On a DMX-16 Surface, or on a DMX-8 that is using the in-line supply, route the category cable to the Mix Engine and plug it into **Port 4** on the **ETHERNET** switch. Plug the in-line DC power supply's IEC AC cord into an isolated AC outlet.
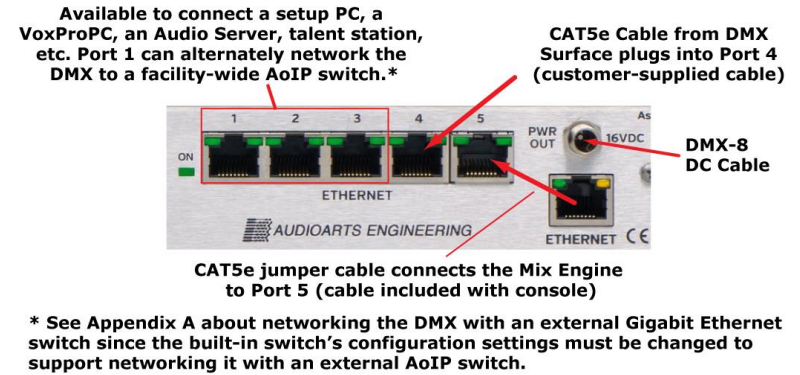
Figure 2-3 Mix Engine, Rear Panel Partial View, Ethernet and DC Power Connections

If not connected already, connect the short category cable supplied with the Mix Engine, from the **ETHERNET** jack to **Port 5** on the Ethernet switch, as illustrated in Figure 2-3

Fastening the Surface to the Countertop

If the DMX Surface must be fastened to the countertop for security reasons, the two front feet from the chassis must be removed. The Surface's control panel (identified in Figure 2-1) must also be removed. Two #6 screws, with oversize washers and lock washers, are required. Their length must extend through the countertop, from below, and go through the two front feet with just enough thread left to fasten to the chassis. The two screws must not extend over ¼" into the chassis when tight to avoid contacting the control panel circuit board or internal cabling.

The cable access hole must already have been drilled (per the four steps listed earlier) and the two Surface cables must have already been run through the hole and plugged into the Surface. The Surface must be unpowered during this procedure:

1. Unscrew the two front feet. Retain the two #6 screws, lock washers, and flat washers for possible future reuse.

2. Remove all of the screws, using a 1/16" hex driver, from around the edge of the control panel. Lift the panel up slightly to unplug one ribbon cable on a DMX-8 or two ribbon cables on a DMX-16. Set the control panel onto padded material.

3. With the Surface set into position, mark the countertop through the front two feet and mounting holes using a pencil a thin center punch, or even the 1/16" hex driver.

4. Move the Surface aside and drill a 3/16" hole at each mark completely through the countertop.

5. *This step requires two persons.* One person inserts and holds the two long #6 screws (each with lock and oversize washers) through the countertop from below with the appropriate screwdriver for the two screws.

   A second person sets the two feet onto the screws and then aligns the Surface over the screws, holding it in position as the two long #6 screws are tightened. Make sure the Surface remains parallel with the countertop edge as the screws are tightened. Do not compress the two rubber feet and verify the end of the screws do not extend more than ¼" above the chassis.

6. Set the back edge of the control panel onto the Surface chassis and plug in the ribbon cable(s). Set the control panel back down onto the chassis and reinstall the mounting screws.

MIX ENGINE CONNECTIONS

To facilitate wiring the Mix Engine, create a wire list, listing all connections to and from peripheral devices. Identify and create labels for each end of each audio, logic, and network cable. List these connections in a master facility wiring logbook to ease installation, future system wiring and equipment changes, and system troubleshooting.

Route all audio cabling to/from the Mix Engine with the maximum practical distance from all AC mains wiring. The Surface's power cable only carries DC voltage, so audio wiring can run parallel to or even be tie wrapped with this cable without issue.

Line level analog, AES/EBU, and logic wiring connect using RJ45 jacks on both the Mix Engine and Razor. Analog line-level inputs and outputs are balanced +4 dBu signals which connect only the plus (+) and minus (-) signals from the peripherals.

Each signal on the audio and logic RJ45 jacks is identified in Figure 2-4. Note that the wire colors listed are for EIA/TIA T568B wiring (straight-thru patch cable wiring) but that category cables may be wired using the T568A standard, which swaps the Orange and Green wire pairs with WHT/GRN on terminal 1, GRN on terminal 2, WHT/ORG on terminal 3, and ORG on terminal 6.

Shielded twisted pair (STP) and unshielded twisted pair (UTP) wiring can be used interchangeably with balanced signals and with logic signals. When crimping CAT5 cables, UTP has an advantage as it's a lot easier to hand crimp than STP wiring.

To simplify your audio wiring, use standard lengths of straight-thru CAT5 cables along with RJ45 Audio Adapters to plug into peripheral device jacks. Angry Audio and other vendors make a wide variety of RJ45 Audio Adapters, most of which are carried by Audioarts and Wheatstone dealers. For more information on RJ45 cable adapters for audio wiring refer to this web page: https://angryaudio.com/studiohub/

AUDIO WIRING	
RJ45 PIN (WIRES*)	SIGNAL
1 (WHT/ORG)	LEFT + / AES +
2 (ORG)	LEFT - / AES -
3 (WHT/GRN)	RIGHT +
6 (GRN)	RIGHT -
4, 5, 7, 8	UNUSED

LOGIC WIRING	
RJ45 PIN (WIRES*)	SIGNAL
1 (WHT/ORG)	GROUND
2 (ORG)	LIO 1
3 (WHT/GRN)	LIO 2
4 (BLU)	LIO 3
5 (WHT/BLU)	LIO 4
6 (GRN)	LIO 5
7 (WHT/BRN)	LIO 6
8 (BRN)	+5 VDC

* EIA/TIA T568B WIRE COLORS

Figure 2-4 Audio & Logic RJ45 Pin Outs & Signals

To simplify logic wiring, NotaBotYet (www.notabotyet.com) has GPIO Logic Adapters for the Logic connectors on the Mix Engine, Razor, and Blades. A straight-thru CAT5 cable connects the RJ45 Logic jack to the GPIO Logic Adapter, which then breaks out the six GPIO connections to screw terminals for wiring "old school" hard-wired peripherals, like warning light interfaces and hot mic LEDs.

When wiring directly from an RJ45 jack on a Mix Engine, Razor, or Blade to individual XLR, TRS, or other audio connectors, single-pair UTP (DataMax 5100 or similar) can be used to wire AES or mono analog connections. Dual-pair UTP (DataMax 5200 or similar) can be used for wiring to stereo connections when a single connector (like a D-Sub) is used on the peripheral device.

When wiring a stereo analog device with two connectors, use two single-pair UTP wires connected to a common RJ45 for the cleanest connection to the two audio plugs. Alternately, separate out the ORG and GRN wire pairs from a standard CAT5 cable to wire to the two audio plugs. For a clean installation, cover each wire pair with tubing held in place with a short piece of shrink tubing over the ends of the tubing and the CAT5 jacket.

The female XLR jacks are designed for microphone cables wired using shielded wiring specifically for low-level balanced mic signals. A monitor output which feeds a powered monitor speaker may also require using shielded cable. In that case the shield terminates at the monitor speaker end since there's no shield connection on the Mix Engine's RJ45 jacks.

Note: StudioHub+ wiring has pin 4 as DC Ground to support PoE (Power over Ethernet). Mix Engine, Razor, and Blade RJ45 connectors **do not tie pin 4 to ground** since these products do not support PoE. Thus, a ground connection can only be made at the peripheral device end. If the peripheral device has unbalanced inputs, with a Tip-Sleeve or RCA connector, a signal matchbox or an audio balun transformer (balanced in, unbalanced out) must be placed in-line to properly unbalance the balanced output signal.

An unbalanced output device can directly connect to a **DMX analog input** by connecting its low (-) signal wires (pin 2, ORG, and/or pin 6, GRN) to GND on the unbalanced device. Connect the hot wire (the unbalanced signal) to the WHT/ORG and/or WHT/GRN wires (terminals 1 and 3). Since unbalanced devices have lower output levels—as compared to a balanced signal, use **Navigator's Device > Sources** tab to raise the input. Any DMX input can be increased by up to +18 dB.

When a **DMX analog output** needs to connect to an unbalanced device, a matchbox or audio balun transformer (balanced-to-unbalanced) must be used.

> ⚠️ **Note:** On Mix Engine, Razor, or Blade outputs, do not connect the low (-) signals (ORG and GRN wires) to ground at the unbalanced device to directly connect an unbalanced device. This will lead to phase and crosstalk issues. It can also lead to component failure over time since this shorts an active op amp output to ground.

Ethernet Connections

Ethernet network wiring also uses RJ45 jacks but, because a WNIP network is running at 1000Base-T (1 Gigabit or 1 GB) only CAT5e or CAT6 cabling should be used. For a short connection, like connecting the Mix Engine to Port 5 or the Surface to Port 4 on the **Ethernet switch** (Figure 2-3 on page 11), a CAT5 cable could be used, but for all longer cable runs only CAT5e or CAT6 cables should be used.

Ports 1, 2, and **3** on the five-port Gigabit Ethernet switch are available to connect a Windows PC running the **DMX Surface Setup** and **Navigator**. This PC won't need to be connected during normal use unless **Navigator** is needed to change signal connections. Alternately, if a VoxPro or other audio editor PC is networked with the DMX, the apps could be installed on that PC. Any open switch ports are available to network a WNIP-compatible media server, a Razor I/O Interface, or any WNIP Blade.

Port 1 can also be configured so the DMX can connect to an AoIP switch to network it with additional WheatNet consoles, Blades, Razor I/O Interfaces, and WNIP-compatible media severs in a larger WNIP network. Appendix A has details on changing the built-in Ethernet switch's configuration settings to support connecting to a WNIP network.

DMX POWER UP

The Mix Engine, Razor I/O Interfaces, and Blades do not have power switches since all are designed for continuous 24/7 operation. All are designed to work with AC mains supplying 90-240 VAC at 50/60 Hz. For the most reliable operation, all DMX components should only plug into isolated ground circuits (orange outlets in the USA) which are ideally on a UPS (Uninterruptible Power Supply).

On a DMX-16, plug in the Surface Supply. On a DMX-8 or DMX-16 plug the IEC AC cord into the Mix Engine. It takes about 90 seconds for each

DMX device to boot up, connect to the WNIP network, and be ready for use. If the DMX-16 Surface is powered up without being networked to a Mix Engine, or if the Mix Engine itself is not powered, the meter bridge level displays' peak LEDs will scan upwards on all meters to visually indicate that the Surface is not properly communicating with its Mix Engine. Once the Surface and Mix Engine are properly connected via Ethernet, the meters' LEDs stop scanning.

When power is first applied to the Mix Engine, the rear panel green On LED (next to the Ethernet switch) lights up first. This is followed by the green LEDs blinking on active Ethernet switch ports. Note that the Surface Ethernet jack only blinks one LED since it communicates at 100Base-T. The Mix Engine and Razor ports will have both green LEDs blinking since they both communicate at 1000Base-T. A networked PC will also only blink one LED if its NIC does not support gigabit speeds.

The front panel LINK LED (Figure 2-5) lights up solid when the Mix Engine's Ethernet jack is connected to port 5 of the Ethernet switch. On a stand-alone DMX, the other two front panel green LEDs: ROUTE MSTR (Route Master) and CLOCK MSTR (Clock Master) also light up solid—after about 90 seconds, indicating the Mix Engine is ready for use.

Figure 2-5 Engine Front Panel Status LEDs

When a DMX is networked with existing WNIP consoles, the new Mix Engine will most likely not be designated as a master, thus its ROUTE MSTR and CLOCK MSTR LEDs could both be off. This simply indicates there's another Mix Engine or Blade in the WNIP network which are set as the Route Master and Clock Master. With multiple Mix Engines or Blades in a WNIP system, one Blade will be designated as the Route Master while a second Blade will be designated as the Clock Master.

If the red ERROR LED should ever light, it indicates an error condition has occurred within the Mix Engine. To reset this error, first try rebooting the Mix Engine using Navigator. If the red LED remains lit after the Mix Engine reboots, power cycle the Mix Engine (unplug the AC cord from the Mix Engine, wait five seconds then plug the AC cord back in).

If the red Error LED lights up again after the Mix Engine restarts it indicates a serious fault which requires service. Contact Wheatstone technical support for assistance. See Chapter 5 (page 59) for information on obtaining service and support for your DMX console.

CHECKING OUT THE DMX FEATURES

Once the Mix Engine and Surface are connected to Ports 4 and 5 on the built-in Ethernet switch, and are powered up, on a stand-alone DMX the Surface and Mix Engine should appear as shown in Figures 1-1 and 1-2 on page 5.

⚠️ **Note:** Figure 4-2, on page 46, identifies each fader channel control and Figure 4-4, on page 50, identifies each monitor control.

On Fader Channel 3, with the channel turned off, rotate the Channel Encoder. The channel's normal display switches to show a list of source names (Figure 2-6). The middle name is highlighted with the name of the device that it's on listed above the white line. Blade01 is the default name assigned at the factory to each Mix Engine.
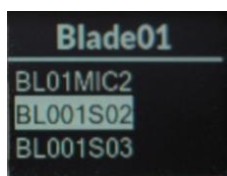

Figure 2-6 Selecting a Channel Source

Rotate the encoder clockwise to move the highlighting down the alphanumeric list of names. Rotate the encoder counterclockwise (CCW) to move the highlighting up through the names. The names wrap to present a continuous list. *NoSource*, which appears at the top of the list, is a good way to identify when the names have wrapped around.

Every physical input on the Mix Engine has a signal name of up to eight characters. The default names all start with BL, for Blade, followed by that Blade's ID number (1 is the ID number for a new Mix Engine). The default names end with a signal number, like S02, to identify the physical "Source" or jack on the Mix Engine, Blade, or Razor. Likewise, the Mix Engine outputs are identified using unique names to identify each Destination: CB001CR (Console Blade 1, Control Room) CB01PGMA (the analog and AES outputs for PGM 1) and so on.

All DMX inputs are set as stereo—except for **Analog Input 1**, which is set as dual mono and assigned the names BL01MIC1 and BL01MIC2. The three remaining **Analog inputs** are BL001S02, BL001S03, and BL001S04. The four **AES inputs** have the default names of BL001S05 thru BL001S08. These match the jack numbers (1 – 8) on the Mix Engine's rear panel.

Analog input 1 is meant to connect to **MICS OUT** so that the two mic preamps can be used without making any configuration changes. If the built-in mic preamps are not used, Analog Input 1 can be changed to a stereo input using Navigator.

As the encoder is turned CW past the Mix Engine's physical input signal names, the internal signals within the DMX are listed. Many, if not most, of these signals are typically not set as "visible" on fader channels, but on a new console every source signal is set visible to ease installing and configuring the DMX. Setting which signals are visible is set using the DMX Surface Setup App.

Rotate the channel 3 encoder so that **BL001S02** is highlighted, as shown in Figure 2-6. Press once on the channel encoder knob to select that signal. This is called "clicking" the encoder–just like clicking a PC mouse button. That connects the highlighted signal to the channel. **BL001S02** is then shown, in green, in the middle of the channel 3 display (Figure 2-7).

The OLED displays are divided by a white line in the normal display. The space above the line indicates when cue, equalization, and dynamics are active on that channel (Figure 2-7). Icons for the High Pass and/or Low Pass Filters are also shown when they're active. EQ (for Equalization) and DYN (for Dynamics) are shown when they're active. From the factory, mic processing is active on channels 1 and 2, and are turned on, hence the **EQ** and **DYN** indications on those two fader channels.

Figure 2-7 Displays for Channels 2, 3, and 4

Below the source name, in orange, is the channel's mode setting. The default setting for every channel is STEREO (mono signals like mics are fed to both left and right channels by default).

To either side of the mode name are icons to indicate source status. On the right side is a lock icon to indicate that source's LIO status (logic control status. On the left side—if the channel source is identified as a mic, there's a mic icon which turns red while that channel is on.

Advanced Channel Features

Each channel has three Advanced Channel Features: **Mode**, **Pan**, and **EQ & Dynamics,** which are accessed by "double-clicking" or quickly pressing twice on the channel encoder knob. The advanced features are all unlocked when the DMX ships from the factory.

"Double-click" the channel 3 encoder (tap it twice quickly). **Mode** now appears above the white line. Rotating the encoder, while Mode is shown in the display, steps through the four audio modes (Right, Left, Mono, and Stereo) that the channel can be assigned. Make sure STEREO is shown then double-click the encoder again.

Pan is then shown above the white line. Now, rotating the encoder pans or balances the signal toward the left or right channel. Readjust the encoder so CENTER is shown then double-click the encoder again.

The channel 1 - 8 OLED displays switch to show **EQ & Dynamics** control screens. The initial display screens show whether EQ & Dynamics are turned on or off on that channel. Additional screens show the EQ & Dynamics settings. On fader channels 1 and 2, EQ and Dynamics are assigned by default for "light mic processing" since these channels are typically assigned to a Host and a Guest mic. The remaining fader channels do not have any EQ or Dynamics settings applied. For now, double-click the channel encoder again. The eight channels will switch back to their normal displays showing their current source names.

⚠️ **Note:** The Mode, Pan, and EQ & Dynamics controls should be selectively locked out from board operator access prior to releasing the console for daily use. This is done using the *Talent Access page tab* in the DMX Surface Setup app (see page 23).

Connecting Audio

To understand the audio connections and DMX Surface controls, connect a stereo analog audio signal, like a +4 dBu test tone from a tone generator or test CD, to the **ANALOG 2 IN** jack on the Mix Engine (Figure 2-9 on the next page shows the Mix Engine jacks). This audio input is named **BL001S02** and is the Channel 3 source that was set in the previous section.

Assign channel 3 to **PGM 1**, **PGM 2**, **PGM 3**, and **PGM 4** (all four assignment buttons are lit). Set the channel fader so the middle line on the fader knob aligns with the two arrows at the -12 dB position. This sets that channel for unity gain. Turn Channel 3 on by pressing and releasing the **On** button directly below that channel's display. The button turns red indicating that **BL001S02** is now feeding the assigned Program buses.

If the input signal is a +4 dBu test tone, then all green meter segments will be lit along with the first yellow segment, which indicates -20 dBFS (decibels Below Full Scale). This equals 0 VU on an analog VU meter. The **Program 1** and **Program 2 meters** should both show this level. The **Switched Meter** should also show this level when the **Meter PGM 3** or **Meter PGM 4** button is lit in the monitor section.

Connect an analog test set to each of the four PGM ANALOG outputs to confirm each has +4 dBu out. Connect a digital test set to each of the four PGM DIGITAL outputs, which have the same signals as the analog jacks, to confirm that each has a -20 dBFS output. The default sources connected to the four PGM outputs are the PGM 1 to PGM 4 buses.

To check the monitor outputs (the four OUT jacks), connect a test set or a powered monitor speaker with a balanced input to the **CR Out** jack. In the left column of the monitor section, select PGM 1 as the monitor source for the Control Room. DMX PGM1 will be shown in the left monitor display

(Figure 2-8). Adjust the **CR encoder** to set the volume of CR Out. Its relative output level is indicated by the bottom bar graph, with the speaker icon, in the left monitor OLED display.

Figure 2-8 Monitor Displays

Move the test output to the **HDPN Out** jack. Its output level, and the DMX Surface's headphone jack level, is adjusted using the **HDPN encoder**. Its level is indicated by the bottom bar graph in the right display with the headphone icon. It has the same monitor source as **CR Out**.

Move the test output to the **STU Out** jack. Its current monitor source is shown in the right-hand display. If *NoSource* appears in the right-hand display, an on-the-fly monitor source can be set for the Studio by press/holding, for about three seconds, the **STUDIO encoder**. A list of source names appears in the right-hand display. Rotate the Studio encoder to highlight DMX PGM2 then click the Studio encoder to assign that source as the Studio monitor source, as shown in Figure 2-8.

With a source selected, use the Studio encoder to adjust the STU Out volume. The studio monitor level is indicated by the upper bar graph in the right display with the speaker icon.

Move the test output to the **CUE Out** jack. Press **Cue** on channel 3 (it lights, and **CUE** is shown in the channel display). Use the **CUE/SOURCE encoder** to adjust the cue volume. The upper bar graph in the left display, with a C, indicates the cue output level. Note that even though this is a "stereo" or two-channel output, the DMX cue output is mono.

⚠️ **Note:** If you followed all the steps in the *Checking Out the DMX Features* section, you should have a good understanding of how to connect audio into and out of the Mix Engine and how to use the DMX Surface controls. The rest of this chapter covers specific details on the audio and logic jacks found on the Mix Engine and the Razor Interface.

Chapter 3 (starting on page 20) covers how to install and use the supplied apps (DMX Surface Setup and Navigator) to name the DMX signals, add logic control, and how to configure the DMX console for your specific application.

MIX ENGINE SIGNAL NOTES

This section covers each Mix Engine connection and how the apps are used to configure that signal or connection. Figure 2-9 shows the audio and logic jacks on the back of the Mix Engine.

Mic Preamps – The two female XLR jacks connect to the Mix Engine's two on-board low-noise mic preamps. Any type of dynamic or condenser mic can be plugged in to boost the mics up to line level. The line level outputs of the two mic preamps are on the MICS OUT jack which is typically jumpered to ANALOG IN 1. These mics are typically assigned to fader channels 1 and 2, which have factory-set EQ and Dynamics Processing already applied, so an external mic processor is not required with the DMX. If additional mic preamps are needed the **Razor 16A Interface** has two mic preamps and the **M4IP-USB** Blade has four SQ mic preamps, along with Vorsis Embedded mic processing, plus four USB ports and local analog and AES outputs for headphone and studio monitors or recording outputs.

Each preamp has a gain control and a recessed phantom power switch on the back panel. For a dynamic mic set the phantom power switch to **off** (+48V LED is off). To power a condenser mic set the phantom switch to **on** (+48V LED is lit yellow).

⚠️ **Note:** Leave the phantom power switch set off until the condenser mic and its mic cable is plugged in, then turn on the phantom power. When a condenser mic must be unplugged, turn off phantom power before unplugging the mic or unplug the cable at the Mix Engine and then unplug the microphone.

MICS OUT – This jack has the line level outputs from both mic preamps: Mic Preamp 1 is the left signal and Mic Preamp 2 is the right signal. Connect a short straight-thru CAT5 cable from **MICS OUT** to **ANALOG 1 IN** since that input is preset for two mono mic signals rather than for a stereo signal as are all other Mix Engine inputs.

The Gain controls are adjusted, once the mics are wired and the Mics Out jack is connected to the Analog 1 In jack, using the Navigator app's Blade > Source tab, which has a Level Meter for each input on the Mix Engine. With the talent speaking at their normal "radio voice level" adjust the mic Gain pot so the top of the green bar graph signal is near -20 dBFS which typically means their peak LED will be around -8 dBFS.

LOGIC - The Mix Engine and Razor Interfaces each have one RJ45 Logic jack for connecting logic to non-IP external devices like a Henry warning light interface, a Mic Arm LED, or a CD player. Each Logic jack has six LIO logic ports (on pins 2–7) plus ground (on pin 1) and +5 volts (on pin 8). Each logic port is independently assigned, using Navigator, to function as a logic output like On Tally, Studio In Use tally, Start Pulse, etc., or as a logic input like Channel On, Channel Off, Ready, Cue, etc.

Each Mix Engine also has 128 Soft LIO (SLIO) logic signals which can be used by WNIP-compatible devices, like talent stations and media servers, for bi-directional command and control of the DMX console over Ethernet. SLIO signals are also assigned using Navigator. Each can be set as either an input or an output. See *Assigning Logic* (starting on page 42) for details on assigning both LIO and SLIO logic.

ANALOG IN - The **ANALOG IN 1-4** inputs are designed for balanced +4 dBu signals. Unbalanced, -10 dBv, signals can also be directly connected, without needing a match box, since each input has input gain and balance controls in Navigator (see *Level & Balance Controls* on page 41).

The inputs have the default names: BL01MIC1 (input 1 left), BL01MIC2 (input 1 right), BL001S02 (input 2), BL001S03 (input 3), and BL001S04 (input 4) in DMX signal lists. Any input can be separated into two mono inputs (see *Changing the Signal Type* on page 40) to allow two mono signals to connect to one RJ45 jack.

DIGITAL IN – The **DIGITAL IN 5–8** inputs are designed for stereo differential AES/EBU (AES3) signals which, in most cases, can alternately have an unbalanced S/PDIF digital signal connected. Their default names are BL001S05 – BL001S08 in the signal list. They have the same gain and balance controls in Navigator as analog signals and any AES/EBU input can also be split into two mono signals for connecting digital phone systems. Digital In 8 can also be used as a Sync Reference input to synchronize the DMX to an external sample clock signal.

PGM OUTPUTS – There are eight PGM Outputs (four stereo balanced analog and four AES/EBU) which, by default, are cross connected to the PGM 1 – PGM 4 buses. These four destinations are named CB01PGMA – CB01PGMD in signal lists. Any source can cross connect to these destinations, but they cannot be split for dual mono out operation and the same signal is applied to both the analog and AES/EBU outputs.

⚠️ **Note:** If you change the source cross connected to any PGM or Monitor output, uncheck the DMX Surface Setup option *Use Default Signal Mapping* (see *Input/Output* on page 23) since that option, when checked, will reconnect the four PGM buses to the PGM outputs, and the default Monitor sources to the four Monitor outputs, whenever the Mix Engine or DMX Surface is rebooted or powered.

Note: The four AES/EBU outputs can only connect to balanced AES/EBU inputs. Connecting an AES/EBU output to an unbalanced S/PDIF input does not work. A signal translation device is required to convert an AES/EBU output into an S/PDIF signal.

MONITOR OUTPUTS – The four stereo analog output jacks: **CUE**, **CR**, **STU**, **HDPN** have the destination names: CB01CUE, CB01CR, CB01STU, and CB01HDPN. Normally, the sources DMX CUE, DMX CR, DMX Stu, and DMX Hdpn are cross connected to these four outputs allowing the four monitor level controls (CUE, CR, STUDIO, and HDPN) to control the monitor output levels. But an alternate source can be connected to any of these destinations. When an alternate source is connected to one of these outputs, the associated Surface level control no longer affects that output. See the Note about unchecking *Use Default Signal Mapping* on the last page when cross connecting alternate sources to the Monitor outputs.

CR OUT is typically connected to powered Control Room monitor speakers, while **CUE OUT** is typically connected to one or two powered cue speakers, so they are not often connected to an alternate source. If the console does not have an associated talk studio, the **STU OUT** jack could instead connect to a hybrid and call recorder, an air skimmer, an internet streamer, or other device. Likewise, the **HDPN OUT** jack, if it doesn't need to connect to an outboard headphone amp, could connect to an alternate source for another stereo analog line output from the Mix Engine.

Note: The built-in ¼" headphone jack, on the right side of Surface has its own destination (**DMX Hdpn**) so it's not affected by changing the source cross connected to destination CB01HDPN.

ADDITIONAL DMX FEATURES

This section covers various special DMX operating features like: using four-wire devices (callers and remotes) with the DMX, how to setup the PGM 4 bus assign buttons to function as Off Line bus assign buttons, how to set the source for the various EXT buttons in the monitor control section of the Surface, how to set up monitor muting, how to setup Events, and how to adjust the gain and balance control on Inputs and Outputs.

Callers & Remotes

A caller or a live remote typically uses a four-wire or Telco device to connect to the console. These type of devices have a *From Network* signal (the audio from that caller or remote) and a *To Network* signal, often called the return or mix-minus audio, which goes back to the caller or remote so they can hear the board operator or the on-air signal—but always minus their own *From Network* audio. This *To Network* audio signal is typically their channel's bus-minus audio which gets cross connected to connect to the input on a hybrid, codec, or other network device.

When the DMX will have a phone caller and/or a live remote connected to the console, the PGM 4 bus assign buttons are typically setup to

function instead as Off Line bus assignment buttons. The Off Line bus is an internal bus that's used solely to create the *To Network* signal for callers and remotes while their fader channel is turned off. When the DMX is configured so the PGM 4 buttons are Off Line buttons, they are most often also setup for pre-switch and pre-fader operation. This allows the talent to carry on a hands-free conversation with a caller or remote while they are not on-air (the caller or remote channel is turned off).

When the caller or remote channel is turned on, their bus minus signal, which is the *To Network* audio, switches to the air signal (typically PGM 1) so that caller or remote hears everything going to air—minus their own audio. This means multiple callers and a remote could all go live-to-air without the board operator having to change any bus assignments or other settings. And, if the board operator needs to talk to a caller or remote while they're live, pressing the **TB** button on the caller/remote channel overrides the PGM 1 bus-minus audio so the board operator can give a cue to a specific caller or remote.

When a caller or remote is on a dedicated fader channel, setting up the *To Network* signal is simple: cross connect that fader channel's bus-minus signal (source names: DMXBM01–DMXBM16) to the phone hybrid or codec output in Navigator's Crosspoint Grid. When callers (or more likely remotes) are setup to be visible on multiple fader channels, things get a bit more complicated since the bus-minus signal connected to the hybrid or codec must change following the channel that caller or remote is on. Fortunately, the Navigator *Associated Connections* feature allows a "trigger condition" to be setup, like taking a codec on channel 15. The system then monitors the various triggers. Thus, when the codec is dialed up on fader channel 15, the system automatically connects the fader 15 bus-minus signal to that codec's To Network input.

Typically, an Associated Connection is setup for each fader that a codec is made visible on so that no matter which channel the codec is taken on, the correct bus-minus signal will get connected to the codec. Setting up Associated Connections is covered in the *Creating and Using Associate Connections* section on page 43.

Using the Off Line Bus

Because the DMX Surface doesn't have dedicated Off Line bus assignment buttons, the PGM 4 bus assign buttons must be setup to function as Off Line assign buttons using the DMX Surface Setup app (see the *PGM 4 / Off Line Options* section on page 26). Once this is done, the board operator's mic channel is assigned to the Off Line bus by lighting up the PGM 4 button. When the caller/remote channel is off, and assigned to cue, the board operator can hear the caller/remote in the cue speakers (or in their headphones) and the caller/remote can hear the board operator talking on their mic, allowing for a hands-free conversation. If a Host or call screener also needs to talk to the caller/remote, then their mic channel is also assigned to PGM 4. They would then talk to the caller using their mic and hear the caller/remote through the cue speaker.

4-Wire Device Connections

Each caller/remote device's *From Network* signal typically connects to a Mix Engine or Razor analog or digital input with two devices sharing a common RJ45 jack input (use Navigator to set that input as two mono signals). A Razor mono analog or digital output is then connected to the *To Network* input on the caller/remote device. The caller/remote output is connected, in Navigator's Crosspoint grid, to the bus-minus signal for the channel that the caller/remote is using.

Of course, any stereo output on a Mix Engine could be connected to a caller/remote but since the Mix Engine outputs cannot be split into two mono signals, you'll end up losing one mono output by doing it this way.

Signal Gain & Balance Adjustments

Navigator has level controls for every physical input and output on the Mix Engine and Razor (see *Level & Balance Controls* on page 41). Up to 18 dB of gain, or 18 dB of trim, from unity gain (0 dB) can be applied in real time to the audio. Viewing and adjusting the level controls for the inputs is done in the **Blade > Sources** tab for each Mix Engine, Razor, or Blade. The outputs are viewed and adjusted in the **Blade > Destinations** tab for each Mix Engine, Razor, or Blade.

Monitor Muting & Hot Mic Logic

Although any signal can be set to mute either monitor output, typically only mics are set to mute an output. For Control Room mics you'll want to mute the CR and CUE outputs, unless Cue only feeds the studio, in which case the Studio mics would be set to mute the STU and CUE outputs. These settings are made using the DMX Surface Setup app's *VDips page tab* (details on using the VDips Page Tab is on page 25).

Setting Monitor & Meter Button Sources

The DMX Surface's monitor section, at the right end of the Surface, has two columns of controls (see Figure 4-4, page 50). The left column (CR) has the meter and Control Room monitor controls; the right column (Studio) has the Events, Timer, and Studio monitor controls.

There are four user-set source selectors (Meter EXT, CR EXT 1 and EXT 2, and Studio EXT) and a large SOFT button. The Soft button can be assigned for various functions from simple (set as a talk-to-producer button or an automation bypass/console active button) to complex (pressing it takes a salvo to setup certain channels for a specific function like voice tracking).

To assign a source to the **Meter EXT**, or to the **CR Monitor EXT 1** or **EXT 2** buttons, press/hold the button for about three seconds, or until the button begins blinking and the left monitor display switches to show the source names available to be assigned to that button. Using the Cue/Source encoder, highlight the desired name then click the encoder to assign the highlighted source to the blinking button, which then stops blinking.

Two sources can be assigned to the **Studio EXT** button: one is set while the button is lit, the other is set while it's unlit. Press/hold the unlit EXT button until it blinks (about three seconds) to set the unlit button source. Likewise, press/hold the lit EXT button (for about three seconds) until it blinks to set the lit button source. In each case the right monitor display switches to show available source names. Use the Studio encoder to highlight a source name then click the Studio encoder to assign the source.

A studio monitor "on-the-fly" source can also be set by press/holding the studio encoder for about three seconds, until the list of visible source names appears in the right-hand monitor display. Highlighted the desired source then click the Studio encoder. The selected source is then shown in red in the right monitor display (Figure 2-8 on page 15). The list of visible source names which can be assigned to the EXT buttons is set using the DMX Surface Setup app's *Visibilities page tab* (page 29).

Saving and Taking Events

The four Event buttons (Event 1 – Event 4) are used to first save and to then take console events. A "Save Event" saves the current settings for all the fader channels which includes the channel source, button assignments, and Advanced Channel Feature settings, along with the monitor panel sources and the user-set button settings. Typically, engineering saves the four events and then locks out the Save function from further use. Only allowing board operators to Take events.

To save an Event, once the console is setup for a specific show, application, or daypart: press/hold the **Event button** you want to use. After about three seconds the button will begin to blink. Continue holding the button for another couple seconds until the button is lit solid. This indicates the current status of every Surface control is now saved to that Event button. Note the event number, and the show, console function, or daypart, so that information can be relayed to the board operators.

Once the desired Events are saved, use the DMX Surface Setup app's *Talent Access page tab* (page 23) to lock out the board operators from accidentally overwriting saved events by unchecking **Allow Save Events**.

To take an Event, press/hold an Event button until it begins to blink then release the button. This arms the Event. Tapping the blinking button takes that event which immediately updates the DMX Surface settings. The Event button is lit solid to indicate it's currently active on the Surface.

Programming the Soft Button

The large Soft button in the CR monitor control column can be assigned to: take a salvo (to make multiple system connections simultaneously), make a momentary connection (useful for talking to an external

destination or for toggling a destination between two sources), be setup as an indicator to show the hotline phone is ringing or some other status, or to control a logic output with button illumination like a Dump button for a profanity delay unit with the LED functioning as a safe indicator.

How the Soft button operates: as a tally only indicator, as a toggle switch, or as a momentary switch, is setup in the *Buttons page tab* in the DMX Surface Setup app (page 28). What the button controls, and how the button's LED is controlled, is set in the Navigator app (the *Assigning Logic* section starts on page 42).

RAZOR INTERFACE NOTES

Razors have eighteen RJ45 jacks: eight for audio inputs; eight for audio outputs; one for Logic LIO; and one Ethernet jack to connect that Razor to a Mix Engine Ethernet switch port or to a facility AoIP switch in a larger WNIP network.

On a **Razor 16A**, sixteen of the RJ45 connectors are used for analog inputs and outputs with each carrying two analog signals (stereo or dual mono). The Razor 16A also has two built-in mic preamps, just like the Mix Engine, with female XLR **Mic Inputs** and an additional **Mics Out** RJ45 jack which is jumpered to the Analog 1 Input using a short CAT5 patch cord. That input comes split into two mono inputs. See *Changing Signal Type* on page 40 for details on changing the Razor input signal type.

On a **Razor 16D**, the sixteen RJ45 inputs and outputs each carry one stereo AES/EBU signal. Any of these inputs or outputs can be split into two mono signals using Navigator (page 40, *Changing Signal Type*).

On a **Razor 16AD** (Figure 2-10 shows its rear panel) jacks 1 – 4 are analog inputs or outputs while jacks 5 – 8 are AES/EBU inputs or outputs.
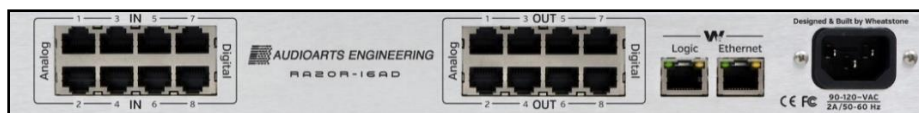

Figure 2-10 Razor 16AD rear panel connections

⚠️ **Note:** Even though every Razor input and output could be set for dual mono signals there are caveats to doing this:

1. The eight input jacks can all be set for 16 mono sources. Each mono source can connect anywhere within the system with no connection limitations.

2. Although the eight output jacks can also be setup for 16 mono destinations, because the Razor only receives eight simultaneous audio streams this can restrict the total number of simultaneous mono signals that Razor can receive, depending upon their sources. If each mono source comes from a different Blade, which is not likely, you could only receive eight mono signals. But, if the mono sources come from less than eight Blades, there won't be an issue in feeding 16 mono signals to the 16 mono destinations.

If one does exceed mono sources from eight Blades, a Navigator error message "No stream receivers available" will appear when attempting to make the Crosspoint.

LOGIC – This jack is used to connect hard-wired logic to external devices like warning light interfaces, remote control panels, and tallies. Each Logic connector is wired per Figure 2-4 on page 12. The logic connections are configured using Navigator to be either a logic input or a logic output with an assigned logic function (see *Assigning Logic* on page 41).

FRONT PANEL DISPLAY & ENCODER - Each Razor has an OLED display and a rotary encoder to select between the four displays available on the Razor.

Figure 2-11 shows the four screens. The first two screens show the Razor's technical details including its system name (Blade 52), ID# (52), IP address (192.168.87.152), sample rate (44.1), Ethernet connectivity (icon in the lower left corner), and how many days and hours it's been in operation. The second technical display shows the Razor's ID and IP address along with the type of Razor (16AD), its MAC address (80:E4:DA:00:2C:37), software revision (v3.7.3) and hardware/firmware build (HW: 0000AA08/A3).

The third display (Inputs) shows the average levels of the sixteen inputs which can be any combination of eight stereo or up to 16 mono inputs. The last display (Outputs) shows the average output level for each output (any combination of eight stereo or up to 16 mono). Each input and output signal can have its gain boosted by up to 18 dB or trimmed by 18 dB using Navigator's input or output gain controls.
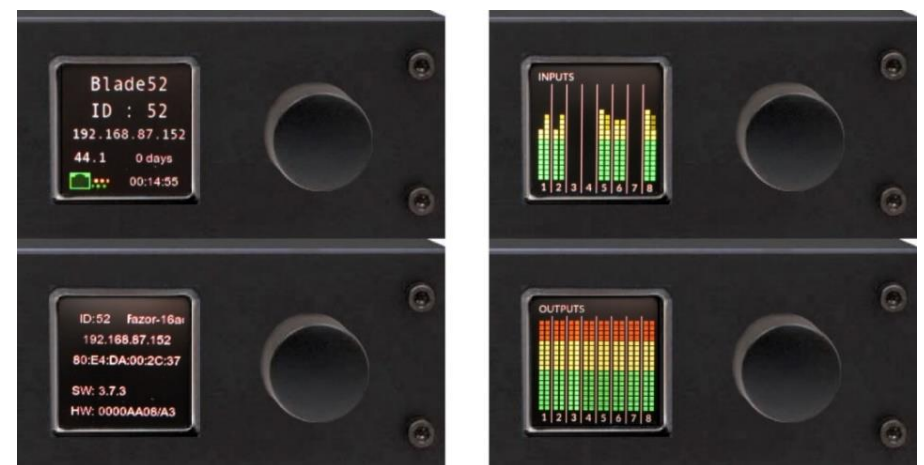

Figure 2-11 Razor front panel OLED displays

3 – DMX APPS AND CONSOLE CONFIGURATION

The DMX console's factory-default configuration settings allow it to be powered up and used straight out of the box. But, to setup the console for your specific application, the default configuration settings must be edited using the software apps on the USB flash drive included with the console. These apps can also be downloaded from the Wheatstone file download site, but you'll need to contact Wheatstone Technical Support to get the links.

The two software apps: **Navigator** and **DMX Surface Setup** can be installed on a PC running Windows XP sp3 up to Windows 10. The DMX Surface Setup app is used to configure the DMX Surface while Navigator is used to name and setup the DMX audio inputs, configure logic control, and cross connect sources and destinations. The PC must be able to communicate with the Mix Engine and DMX Surface so it must be set to a fixed IP address in the **192.168.87.0 subnet**. Even though the DMX can be changed to use a different Class C subnet, we recommend leaving the DMX devices on the default 192.168.87.0 subnet.

Before installing the apps, connect the PC to the DMX using **Port 1**, **2**, or **3** on the Mix Engine's Ethernet switch (shown in Figure 2-3 on page 11). We recommend setting the PC's Network Interface Card (NIC) to **192.168.87.21** with a subnet mask of **255.255.255.0**. This puts that PC on the same subnet as the Mix Engine (its default IP address is **192.168.87.101** and its name is **Blade01**) and the DMX Surface (its default IP address is **192.168.87.201** and its name is **Surf01**).

To ensure the apps install properly, right-click on the installer icon, or its file name, and select "Run as Administrator." Shortcut icons are added to the desktop. In the Win 10 Start menu, the apps are added to the *Wheatstone* folder and to the Recently Added app list.

DMX SURFACE SETUP APP

Double-click the desktop icon (shown at right) or use the Start menu to select DMX Surface from the Wheatstone folder. The DMX Surface Setup app opens showing the *Device Properties* tab. Figure 3-1 identifies the main controls and the two panes (Devices and System Info) which can be "torn off" and viewed as stand-alone windows.

Click on the *Locator* tab to view it (Figure 3-2). This tab lists each WheatNet-IP (WNIP) device connected to the Mix Engine's Ethernet switch. For a new DMX console only two devices will be listed: the Mix Engine and

the DMX Surface. Figure 3-2 shows that a talent station and a Razor Interface are also connected to the built-in switch.
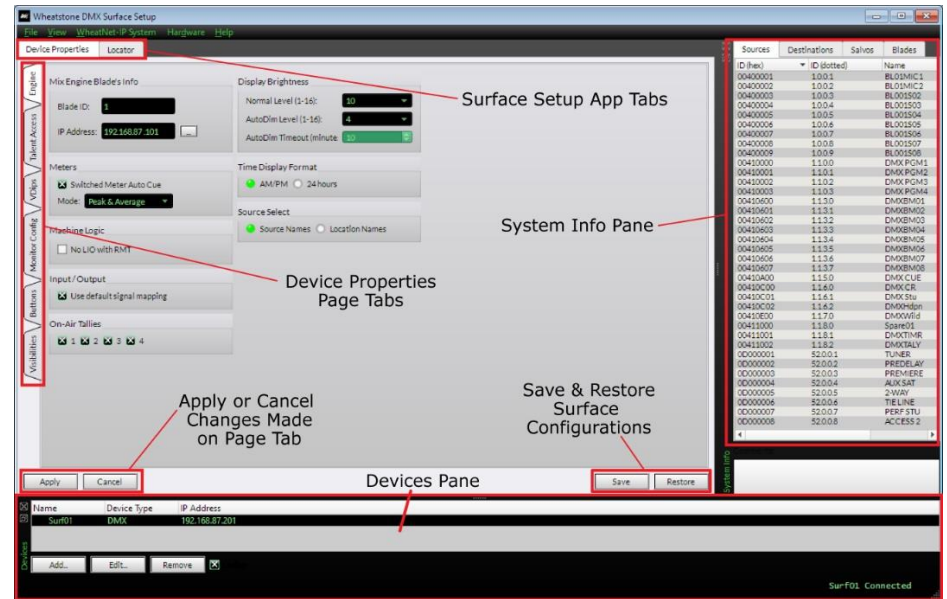

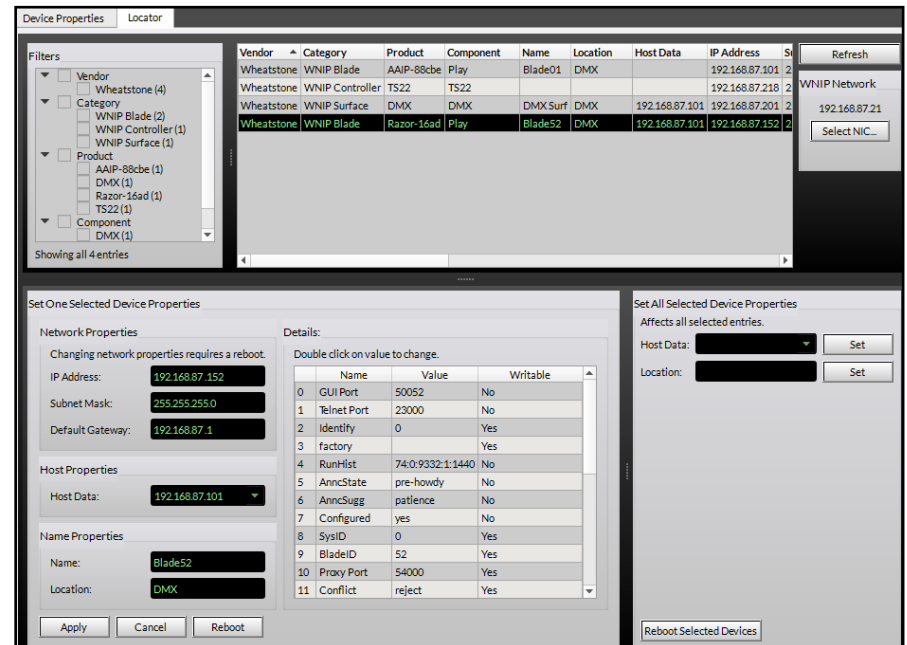**Figure 3-1 DMX Surface Setup, Device Properties Tab View**

Figure 3-2 DMX Surface Setup, Locator Tab View

If no devices are listed, verify the correct IP address is shown above the *Select NIC…* button. If the wrong NIC is listed, click *Select NIC…* to open the **Network Setup** window to select the correct NIC. If the NIC is correct, confirm that the PC, Mix Engine, and DMX Surface are all connected to the Mix Engine's Ethernet switch then click *Refresh* to re-query the network for WNIP devices.

If no NIC with an IP address in the default subnet (192.168.87.0) is listed then close the DMX Surface Setup app and use the Windows Control Panel to assign a fixed IP address, like 192.168.87.21 to the NIC, then restart the DMX Surface Setup app.

Click on a device row in the *Locator* pane (a Razor Interface is shown selected in Figure 3-2 on the last page) to show details for the selected device in the *Set One Selected Device Properties* panel. The default settings for devices can be manually edited to change the assigned IP address, Host Device, Name, and Location when networking multiple DMX consoles and Razors together.

⚠️ **Note:** When multiple WNIP devices (DMX consoles, Razors, Blades, etc.) are being networked together, use Navigator Locator tab (page 39) to edit their default entries in its *Device Properties* pane. You would do this for each new WNIP device to change them from their factory default settings so that networking additional new devices in the future is simplified since you won't have to contend with conflicting IP addresses, Names, or ID numbers.

Setting the Surface Host

At this point the DMX Surface Setup app is simply showing the WNIP devices it's detected on the network. Before the DMX Surface can be configured the WNIP system must be scanned to add the devices and signal information to the DMX setup app. Once this is done the Mix Engine that Hosts the DMX Surface can be assigned.
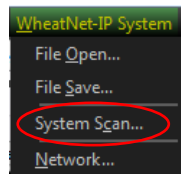
The first step in this process is to click the menu item: *WheatNet-IP System* and select *System Scan* to open the **System Scan** window, shown at right. The *Host Blade IP Address* should show 192.168.87.101 (the Mix Engine's default IP address on a new DMX console). If no address is shown, manually enter that IP address into the entry box.

Click *Start Scan*. The app queries that Blade (the generic network identity of a Mix Engine) and shows various messages in the log window. Once *Finish* appears in lieu of *Cancel*, click it to close the System Scan window. A "save system info?" dialog pops up. Click *Yes* to save the system information. A Save File dialog box opens
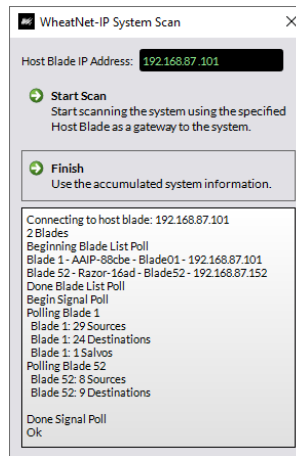
showing the default save location. Click *Save* then *Yes* to save the **sysinfo.wnsi3** data file, which saves your system information to the PC.

The *System Info* pane, at the right side of the app window, will now be populated with *Source* names, as shown in Figure 3-1 on the last page. Clicking on the other tabs: *Destinations, Salvos,* and *Blades* will show the scanned Destination names, that no *Salvos* have been created yet, and that the Mix Engine is **Blade ID 1** with the default name of **Blade01**.

Click on the *Device Properties* tab to return to show that tab. It has six **Page Tabs** (Engine, Talent Access, VDips, Monitor Config, Buttons, and Visibilities) along the left side of the tab (Figure 3-1 on the last page). The page tabs allow various DMX parameters to be viewed and edited to configure the DMX Surface for your application. Click on each page tab to see what each has to offer then reselect the *Engine* page tab.

Each page tab is separated into **sections** which list similar parameters. In the *Mix Engine Blade's Info* section (Figure 3-3) click the *Picker* icon (the small rectangular icon) to open the **Blade Picker**, which lists the detected blades. Double-click the **Blade01** row to select it. This closes the Picker and transfers the Blade ID and IP address into the two entry boxes.
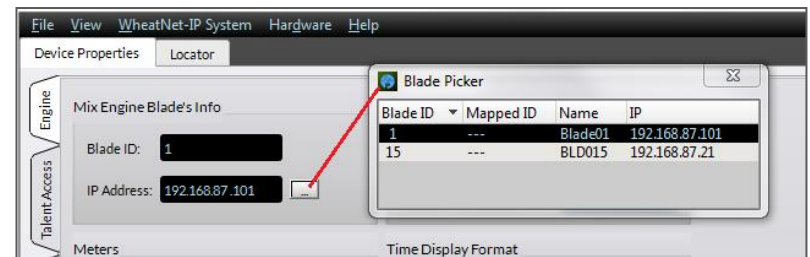

Figure 3-3 Setting the Mix Engine as the Surface Host

This action sets that Mix Engine as the "host" for the DMX Surface. Next, the DMX Surface that's being hosted by this Mix Engine must be selected so that the Surface Setup app can communicate directly with it. This is done using the *Devices* pane at the bottom of the app window. When the app is first used this pane will be empty.

⚠️ **Note:** If this pane is not displayed select the menu item *View* then check *Devices* to display the *Devices* pane, as shown at the bottom of Figure 3-2.

Click the *Add* button to open the Add Device dialog box (Figure 3-4 on the next page). In the Add Device window click *Locate…* to open the Locate window. If **Surf01** is not listed, click *Rescan*. Once **Surf01** is shown, click on its name to highlight it then click *OK*. The new DMX Surface name (**Surf01**) and its IP address (**192.168.87.201**) are then entered into the *Add Device* dialog box (the *Device Type* is automatically set as **DMX**). Click *OK* to transfer the settings to the *View Devices* pane.

To now connect to that DMX Surface, click on its row to highlight it then click the small square next to *Remove* ("X" the box). This instructs the admin PC to contact that Surface. **Surf01 Connected** should appear momentarily in the lower right corner of the Devices pane which indicates that DMX Surface is now communicating with the PC. Its current settings are uploaded to the app to populate the various Page Tabs.

Once the PC is communicating with both the Mix Engine and Surface, the DMX Surface Setup app is then used to configure the DMX console for your specific application.

Figure 3-4 Selecting the DMX Surface in the DMX Setup App

⚠️ **Note:** Several settings, like editing the console's default signal names, editing their signal formats, and configuring logic, are done using **Navigator**. Information on using it starts on page 31).

Device Properties Page Tabs

The DMX Surface Setup page tabs are divided into sections to group similar configuration settings. Changes made on a page tab are all "pending" until the *Apply* button, just below the page tabs, is clicked to upload the changes to the DMX Surface.

If you've made changes on a page tab but did not click *Apply* before clicking on another page tab, you'll get a pop-up warning (Figure 3-5) about applying changes to the previous page tab. Clicking *Yes* applies the changes. Clicking *No* discards all changes made on the previous tab since the last time *Apply* was clicked.
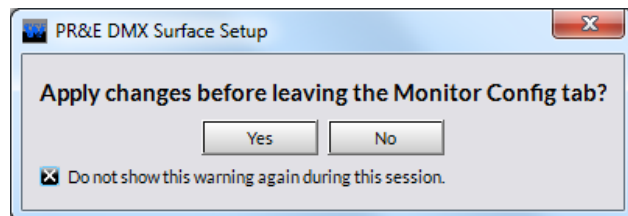

Figure 3-5 Apply Changes Warning Pop-Up

⚠️ **Note:** We recommend **unchecking** *Do not show this warning again during this session* before clicking Yes or No so that you keep getting the popup. If left checked the popup no longer appears but the default selection is **No** which means if you switch to a new page tab any unapplied changes on the previous page tab will be discarded.

Engine Page Tab

The *Engine* page tab has eight sections: Mix Engine Blade's Info (covered in *Setting the Surface Host* section on page 21), Meters, Machine Logic, Input/Output, On-Air Tallies, Display Brightness, Time Display Format, and Source Select which affect the overall Surface operation.
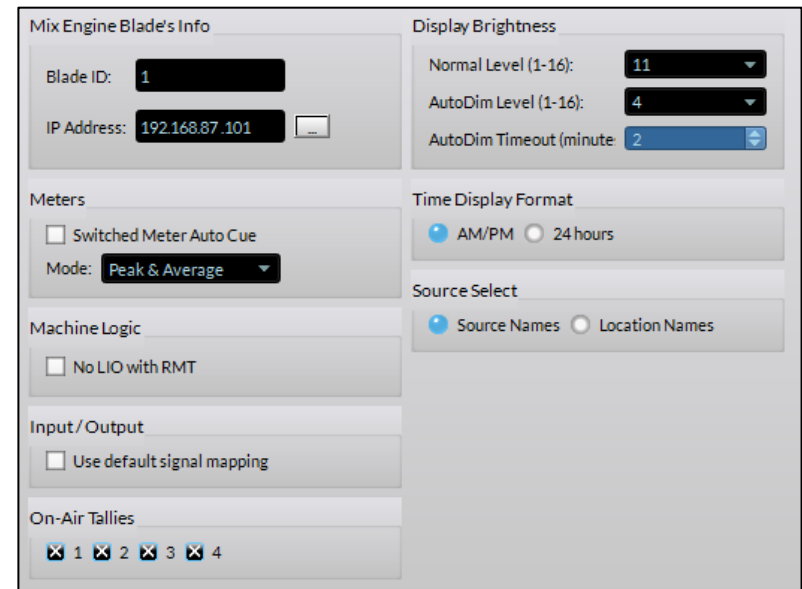

Figure 3-6 Engine Page Tab

Meters

When *Switched Meter Auto Cue* is checked (click the box to add an X) the cue bus level is shown in the switched meter when cue is active. This overrides the source set by the Meter Select buttons. When unchecked, the default setting, cue does not affect the switched meter display.

The *Mode:* setting affects all three meters. *Peak and Average* is the default setting, but the meters can alternately show *Average Only* or *Peak only* for special applications. The Average signal level is shown using a bar graph display while the Peak level is shown using one LED per channel, to indicate the highest instantaneous audio level, which is typically 6 – 12 dB above the top of the average level bar graph. Note that the Peak decay time is fixed.

Machine Logic

This sets whether there is a logic output (either a tally or a start/stop pulse) when remote channel on/off commands are received. When *No LIO with RMT* is unchecked, the default setting, tally or remote start/stop commands are sent out with remote channel on/off commands. When this option is checked, no tally or remote start/stop command is sent when the channel is remotely turned on or off.

Input/Output

When *Use Default Signal Mapping* is checked the default cross connections to the Mix Engine's four monitor and four program outputs are remade and locked when the Mix Engine or Surface gets rebooted.

⚠️ **Note:** If you switch any monitor or program output's cross connection from their default settings you must uncheck this option or else your cross connections will be overwritten with the default connections when the Mix Engine or Surface gets rebooted.

On-Air Tallies

The four on-air tallies (1 – 4) are usually all left checked even though, typically, only Tally 1 (Control Room warning) and Tally 2 (Studio warning) are normally used. Tally 3 and Tally 4 can be used to trigger hot mic warning lights in external locations, like an announce booth, a newsroom, or a sports bullpen. The tallies are triggered when the logic function: *Studio 1 In-Use* up to *Studio 4 In-Use* gets assigned as the logic output command for an LIO or SLIO.

Display Brightness

These three parameters control the OLED displays' brightness levels.

The *Normal Level* setting sets the brightness of the OLED displays from 16, the maximum OLED brightness, to 1, which is virtually off. Because OLED displays will burn-in after displaying the same graphic over a long period of time—and also gradually dim over time, we do not recommend setting a new console to a *Normal Level* of 16. The default level is 10, but you'll want to use the lowest setting that still yields an easy-to-read display. In production rooms with very low lighting this might mean a setting of 6 matches the ambient lighting in the studio. To see the new setting reflected in the OLED display brightness, click *Apply* to transmit the updated setting to the Surface.

The *AutoDim Level* setting is used with the *AutoDim Timeout* entry. When the *AutoDim Timeout* is reached, the OLED displays dim to the assigned *AutoDim Level* setting. Setting the *AutoDim Level* to 1 effectively turns the displays off. The default entry is 4.

The *AutoDim Timeout* entry sets how many minutes, from one to 59, must pass after a Surface control was last touched before the OLED displays switch from the *Normal Level* to the *AutoDim Level*. The default setting is 10, which means that after no Surface control has been touched

for ten minutes, the OLED displays automatically dim down to the *AutoDim Level*. When an operator touches any control, the dimmed OLED brightness umps back to the *Normal Level*.

⚠️ **Note:** Setting the timeout to 0 defeats auto dimming and the *Normal Level* setting is used all the time. This is OK for console configuration, but we recommend that the *AutoDim Timeout* be set between 2 and 10 minutes with the *AutoDim Level* set between 2 and 4 so a dim image still appears in the OLED displays.

Time Display Format

The right monitor display shows the time-of-day in standard USA 12-hour format (*AM/PM*) or using military/European format (*24-hour*). The left monitor display always shows the date as Month Day Year. The current date and time must be set using Navigator's *Info tab* (see page 34 *Info Tab* for details).

⚠️ **Note:** The date and time must be reset using Navigator each time the DMX is power cycled.

Source Select

The default selection is *Source Names*. When any encoder is used to select a new source, all visible source names are listed alphanumerically with their host Blade name appearing above the white line in the display.

When *Location Names* is selected, using the encoder to select a new source first shows a list of Blade names. Clicking a Blade name then shows all the visible sources on that Blade. To view signals on another Blade, click << *locations* to step back to the Blade list so that another device can be selected. Most users leave *Source Names* selected.

Talent Access Page Tab

This page tab (Figure 3-7 on the next page) sets board operator access to various Surface functions. Three sections: *Events, Bus Assignments*; and *Channel Features* control access to the Event buttons, bus assignment buttons, and the advanced channel features. When unchecked a board operator cannot change or select that feature.

The *Timeout* section sets whether the Mode, Panning, and EQ & Dynamics displays time-out (option checked) or stay active until they are manually closed (unchecked).

The *EQ* section allows the current EQ and Dynamics settings set on any channel to be pulled from and saved to an "EQ config file" or a saved EQ config file can be pushed to another DMX fader channel.

While configuring the console all the section entries are typically left checked except for the *Timeout* entry. When it's unchecked the Advanced Channel Features will not auto-timeout, which makes setting up the channel EQ and Dynamics a lot easier.

It's important that one selectively limits access to the Advanced Channel Features prior to releasing the console for daily operations. Typically, in an on-air studio *Allow EQ & Dynamics* is unchecked, once these are set during configuration since, in the wrong hands, access to these controls could result in one or more channels suddenly having very "strange sounding" audio!
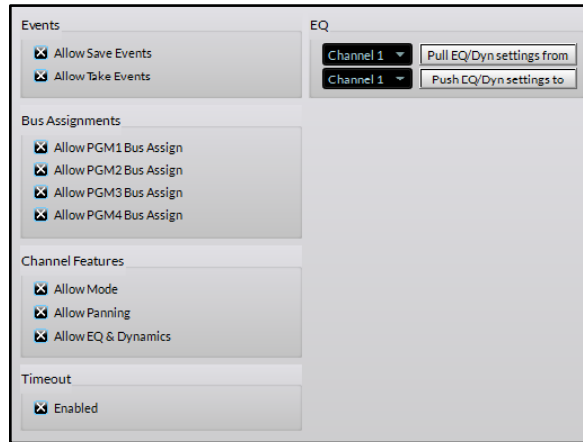
Allow Save Events is also typically unchecked once the four console events have been saved during configuration.

Timeout Enabled is normally checked so that any enabled Advanced Channel Features (like *Mode* and *Panning*) will timeout (return to a normal display) after no Surface control has been touched for twenty seconds.

Events

These two selections set board operator access to the four **Event buttons** in the monitor section of the DMX Surface. The Event buttons are used to first save, for later recall, up to four console setups. A console setup includes the current monitor settings, current channel sources and channel button settings, and the Advanced Channel Feature settings. By saving the four most-commonly-used board setups each can later be recalled at the touch of an Event button.

For example: **Event 1** could be used to recall the console settings for a morning show with multiple mics and a remote traffic service; **Event 2** could setup the console for a single board operator; **Event 3** could set up the console for a regularly scheduled live remote; and **Event 4** could set up the Surface for overnight or unattended/automated operation.

When *Allow Save Events* is checked, anyone can save an Event—which overwrites any previously saved Event. When unchecked, the Event Save function is not active. This selection is typically unchecked once the four Events are saved during console configuration.

When *Allow Take Events* is checked, the board operator can take Events. When unchecked the four Event buttons have no function. If *Allow Take Events* is unchecked, then *Allow Save Events* should also be unchecked.

Bus Assignments

These four selections set whether the board operator can change the **PGM assignment button** settings across all console channels. For most

Figure 3-7 Talent Access Page Tab

applications all four buttons are checked to allow the board operators to freely turn any bus assignment button on/off, as required.

Unchecking one or more *Allow PGM Bus Assign* selections (and then clicking Apply) means the PGM button settings, as currently set on the console, cannot be changed by a board operator. This might be done for consoles that serve dual purposes, like simultaneous on-air and network origination. The PGM buttons would be pre-assigned for the correct operational mode and then would be unchecked here to prevent board operators from changing one or more PGM bus assignment settings.

Channel Features

This section sets which Advanced Channel Features will be accessible by board operators.

Allow Mode, when checked, allows a fader channel's audio mode to be changed from Stereo (the default setting) to Left only, Right only, or Mono sum. When unchecked, this feature is locked out from board operator use.

Allow Panning, when checked, allows left-right panning control of the audio signal on that fader channel. When unchecked, this feature is locked out from board operator use.

Allow EQ & Dynamics, when checked, allows the four-band parametric equalization, the high and low pass filters and shelving, and the audio dynamics (compression and expansion) to be adjusted and set for any channel. This feature should only be accessed by engineering while configuring the console. Once the EQ and Dynamics are set, *Allow EQ & Dynamics* should be **unchecked** to prevent board operators from accessing this powerful feature.

⚠️ | **When the DMX Surface Setup app is on an air studio PC, assign a user password (File > Set Password) to prevent app access, if only to keep Allow EQ & Dynamics from being checked—assuming it's been unchecked prior to releasing the console for daily usage. In the wrong hands, changing the EQ & Dynamics settings could result in a channel sounding "very strange" or even becoming severely distorted.**

Details on using the Advanced Channel Features are presented in Chapter 4 (starting on page 52).

Timeout

Unchecking *Enabled* allows any Advanced Channel Feature to remain displayed until manually changed by the user—a very useful function for adjusting EQ & Dynamics during console configuration. Once configuration is finished, check *Enabled* so that any Advanced Channel Feature will automatically time out and revert the channel display (or displays in the case of EQ & Dynamics) after no surface control is touched for 20 seconds.

EQ

This section's controls allow one to pull and save the equalization and dynamics settings from any channel to an EQ file. The EQ file can then be pushed to any other fader channel so it then has those EQ and Dynamics settings.
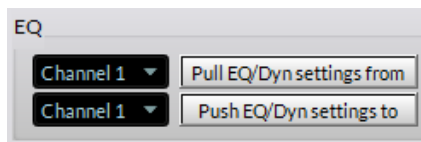
The top row controls are used to save the EQ & Dynamics settings from a selected channel to an EQ file. First, select the channel with the EQ & Dynamics settings you want to save using the drop-down channel list. Click the *Pull EQ/Dyn settings from* button. A Save Dialog box opens so you can name the EQ file. A .dmx_eq suffix is automatically added to the name you enter. The EQ file is saved in the WheatNetIP_DMX folder that's in the PC user's Documents folder.

The bottom row controls allow the settings from a saved EQ file to be loaded into another channel. First, select a channel from the drop-down list then click the *Push EQ/Dyn settings to* button. A pop-up warning asks whether you want to alter the settings on that channel. Clicking Yes opens a Find File Dialog box to select a previously saved EQ file. Clicking No closes the warning box.

⚠️ **Note:** The EQ settings are immediately applied—even on a channel that's turned on, which can noticeably change that channel's audio as soon as the EQ & Dynamics settings are applied.

A Wheatstone_mic.dmx_eq file is included with the DMX Surface Setup app which has the EQ & Dynamics settings applied to channels 1 and 2 on a DMX shipped from the factory.

VDips Page Tab

This page tab is where console options and logic features are assigned to specific audio sources. Mix Engine and other system signals, which need to have logic settings associated like mics and devices with remote logic, are manually added to the *Signals* list (Figure 3-8) using the *Add…* button. Once a signal is added, clicking its **Signals list** row highlights that signal and displays its current logic settings in the seven assignment sections on the right half of the page tab. These settings can then be edited as required. To see/hear the effect of the new selections, click *Apply* to transmit the updated settings to the DMX Surface.

⚠️ **Note:** Before adding your signals to the Signals list, run a System Scan (see *Setting the Surface Host* section on page 21). The signal names are edited in Navigator and are automatically updated in the console displays, but the DMX Surface Setup must be manually updated by running a new System Scan to download any name and format changes which were made using Navigator.

Default Settings

Before adding any signals to the *Signals* List, read through the descriptions of the various logic settings over the next few pages. You may find selections which should be applied to multiple sources. These common selections can be automatically checked on each newly added signal by clicking the **Default** row, at the top of the *Signals* list, and then enabling the desired "Default" selections. Figure 3-8 shows the Default row is highlight and that *PGM4 Pre-Fader*, *PGM4 Pre-On*, *PGM4 OffLine, CR Mute* and *Tally 1* are all checked. In this case, when Mic 1 and Mic 2 were then added, both of those signals were added with these settings already assigned. The Default selections can be reedited for a different type of signal. For example, changing CR Mute and Tally 1 to Studio Mute and Tally 2 would then allow multiple Studio Mics to be added with those settings.
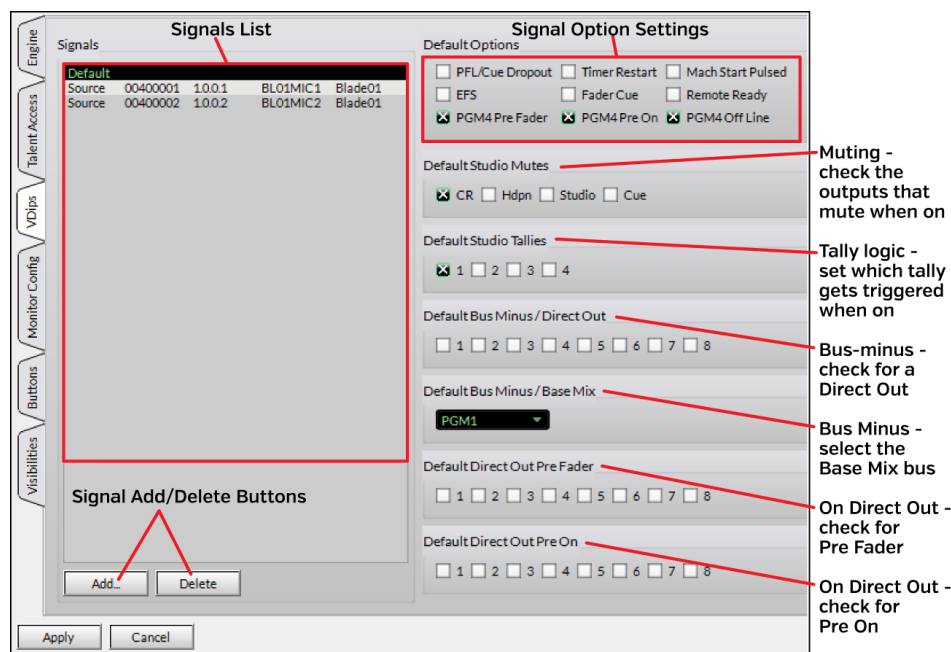
Signals List

Sources must be manually added, one at a time, to the Signals list to populate it. To add a new signal, click *Add…* to open the *Add Signal* pop-up selector (shown in Figure 3-9 on page 26). Click the *Picker* button (⬚) to open the *Source Picker*. Double-click a signal row to select that signal. This closes the *Source Picker* and adds that signal number to the picker window. Click *OK* to add that source to the Signals list and close the Add Signals box.

Repeat this process (click *Add…,* click the *Picker* button, double-click on another source row then click *OK*) for each source you need to configure. Fortunately, this repetitive process only needs to be done once.

⚠️ **Note:** Clicking *Apply* immediately updates all signal settings—even for sources which are currently turned on, so use caution when making signal changes to a console that's already on-air.

If any *Default Options* are checked, those options are automatically checked on each newly added signal. Each newly added signal is also automatically selected (highlighted) so additional configuration settings can be edited as required. To see the effect this has on the source channel's functions, click *Apply* to send the updated settings to the Surface.
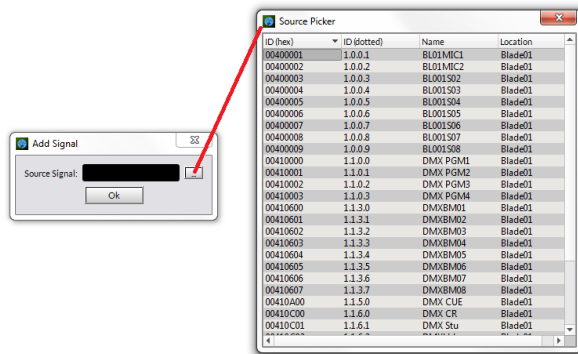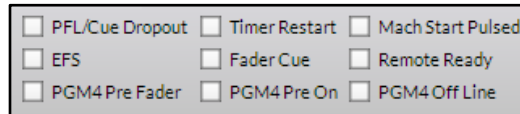
Figure 3-9 Adding a Source to the Signals List

Options

These nine settings affect fader channel operation when the selected signal is the active source for a fader channel.

PFL/Cue Dropout – Controls what happens when the fader channel is turned on. When checked, cue (alternately called PFL or Pre-Fader Listen) gets automatically turned off, if active, when the channel is turned on. When unchecked, and cue is active, cue remains active when the signal's channel is turned on. If *Fader Cue* is checked, this option is unchecked.

Timer Reset – When checked, a Timer Reset command is sent to the timer each time that signal's channel is turned on. If unchecked no timer reset is sent to the timer.

⚠️ **Note:** For the Timer Reset function to reset the timer, the **Timer Auto** button must be lit on the Surface. When the **Timer Auto** button is unlit, the timer reset command, even if checked, will not reach the timer.

*Mach*ine *Start Pulsed* – Sets the type of logic command sent to the signal's remote logic. When checked, a Start Pulse is output. When unchecked, a sustained closure (tally) occurs for as long as the source channel is on.

EFS (*Electronic Fader Start*) – Controls whether moving the signal's channel fader affects channel on/off. When checked, moving the fader to full off turns the channel off and moving the fader away from full off turns the channel on. When unchecked, fader movement does not affect channel on/off status. This command is typically assigned the same for all signals although some users only enable this feature on microphones.

Fader Cue – This setting is like *EFS* in that fader movement affects channel status. When checked, moving the fader to full off turns cue on and moving the fader away from full off turns cue off. This action emulates a feature found on analog consoles with rotary volume controls which put the channel into cue when the pot was turned to full off. When unchecked, fader movement has no effect on cue—unless *EFS* and *PFL/Cue Dropout* are both checked, in which case cue is turned off when the fader is moved from full off.

Remote Ready – When unchecked, the standard setting, the Off-button LED lights up while the channel is off. When checked, the Off-button LED is controlled by that signal's Ready command logic which is assigned in **Navigator** (see *Assigning Logic* on page 42).

PGM 4 / Off Line Options

The PGM 4 bus differs from the PGM 1 – PGM 3 buses in that specific signals can be set to feed PGM 4 pre-On button and/or pre-fader by checking the *PGM 4 Pre-On* and *PGM 4 Pre-Fader* selections, while leaving the *PGM 4 Off Line* selection unchecked. This would allow the PGM 4 bus to feed an FX unit or an air skimmer.

When callers and/or remotes (any Telco or 4-wire signal from a hybrid, codec, two-way device, etc.) will connect to the console, the *PGM 4 Off Line* option should be checked on their signals. This option switches the PGM 4 buttons to instead be Off line bus assignment buttons. The PGM 4 buttons are then used to set which channels get fed to the bus-minus signal going back to the caller/remote while their channel is turned off. When the caller/remote channel is turned on, their bus-minus signal switches to the bus assigned in the Bus-Minus/Base Mix section (most often PGM 1, but it can be set to any PGM bus including PGM 4) so the caller/remote hears everything else going to air.

This means that when *PGM4 Off Line* is checked—**on any signal**, the PGM 4 buttons then function as Off Line bus assign buttons. Typically, when the Off Line bus is active the PGM 4 bus is not used. When *PGM4 Off Line* is unchecked **for all sources**, the PGM 4 buttons assign the channel sources to the PGM 4 bus like normal and the Off Line bus is not used. In this condition, the caller/remote bus-minus signals are always derived from the bus assigned in the Bus-Minus/Base Mix section.

Note: The *PGM4 Pre-Fader* and *PGM4 Pre-On* settings affect both PGM 4 and the Off Line audio. This means the PGM 4 output, which is still active even when *PGM4 Off Line* is checked, could have some sources active all of the time (if *PGM4 Pre-On* is checked) and those could be at a fixed level (if *PGM4 Pre-Fader* is checked), which could lead to unexpected operation. Thus, we recommend **not using** the PGM 4 bus when Off Line is active (i.e., when the *PGM4 Off Line* option is checked for any source). Navigator can be used to connect a different source to the output labeled as PGM OUT 4 on the Mix Engine.

PGM4 Pre-Fader –When checked, the signal feeds the Off Line and PGM 4 buses without fader level control (the same level as cue). When unchecked, the channel fader affects the level feeding both Off Line and PGM 4.

PGM4 Pre-On – When checked the signal always feeds the Off Line and PGM 4 buses, unless *PGM 4 Pre-Fader* is unchecked, in which case the fader still controls the level. When unchecked, the signal only feeds the Off Line and PGM 4 buses when the channel is turned on. Typically, this setting is checked for all sources so that no channels must be on in order to feed the Off Line bus.

PGM4 Off Line – This setting affects the bus minus signal sent to callers and remotes. It also affects how the PGM 4 assignment buttons function. When checked on any source, the PGM 4 buttons also assign the channel to the Off Line bus. When unchecked on all sources, the PGM 4 buttons assign channels to the PGM 4 bus and the Off Line bus is not active. For a caller/remote this means they always hear the bus assigned in the Bus Minus/Base Mix selection (default setting is PGM 1 for all sources).

Studio Mutes

Any signal can be set to mute one or more of the monitor outputs when their channel is turned on, but typically only microphones are set to mute outputs. For mics located in the Control Room, both the *CR* and *Cue* outputs are typically checked (muted). For mics located in a Studio, typically only the *Studio* output is checked (muted), unless cue is fed to the studio, then *Studio* and *Cue* would be checked.
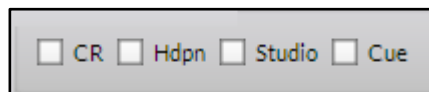
Usually the HDPN output is never checked. Figure 3-10 shows the typical settings for a CR mic and a Studio mic.

Studio Tallies

Each mic is typically set to trigger one of the Tallies. Tally 1 is typically used for the Control Room while Tally 2 is typically used for an associated talk studio. Tallies 3 and 4 can be used to trigger hot mic warning lights at two additional locations like a
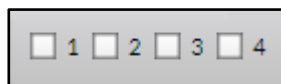
producer position, call screener, newsroom, etc. Assigning a Tally activates two Surface displays when a mic channel is on: a red **On-Air indicator** lights up in the Meter Bridge; and a **mic icon**, shown in the channel display to the left of the Mode name, which turns red. These mic status indicators will not be shown if a mic is not assigned to a light a Tally.
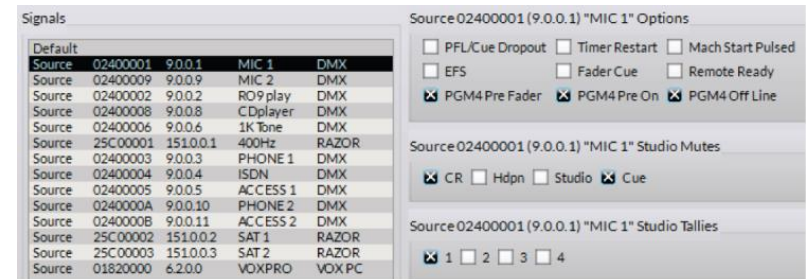

Typical Control Room Mic Settings
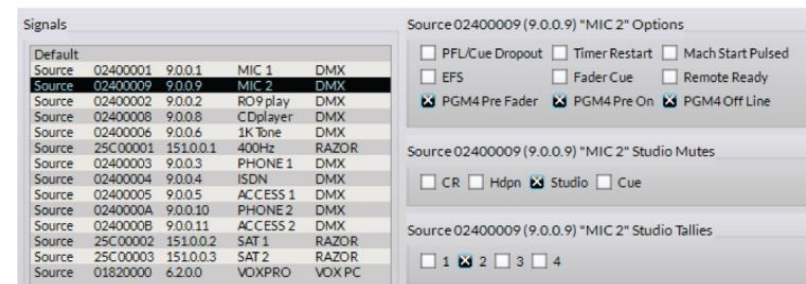
Typical Studio Mic Settings

Figure 3-10 CR & Studio Mic Settings

Bus-Minus / Direct Out

The DMX includes an internal mono signal that's associated with each fader channel. For a DMX-8 Surface there are eight check boxes, for a DMX-16 Surface there are sixteen check boxes. These signals have the default names: DMXBM01 – DMXBM16, with the BM standing for *Bus-Minus*, which are audio signals specifically used with callers and remotes. Any of the mono "BM" signals can alternately be used as a Direct Out signal to feed an outboard FX unit, air skimmer, or system monitor.
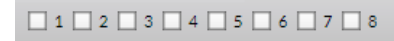
The settings in this section set which type of signal is generated when the signal is on a channel. If no boxes are checked a bus-minus signal is created on any channel that signal is on. When one or more boxes are checked, and that signal is taken on a checked channel, a Direct Out signal is created for that channel.

Note: The Direct Out audio is affected by the settings in the *Direct Out Pre-Fader* and *Direct Out Pre-On* sections.

For a caller or a remote device, no channel boxes should be checked so that a bus-minus signal is created when that those devices are taken on a fader. This means an IFB (Interruptible Fold Back) audio signal is created that which can be returned to the caller/remote so they can either hear the board operator or hear the program audio (always minus their own audio). This also means that any fader channel can have a codec or a phone hybrid on it since every channel has its own unique IFB signal.

Bus Minus / Base Mix

This selection sets which bus: PGM 1, PGM 2, PGM 3, or PGM 4 is used to create a bus-minus IFB (the BM signal) which would be sent back to the caller/remote while their channel is on—assuming the Off Line bus is used to feed the caller/remote while their channel is off. The default, and normal selection, is PGM 1.
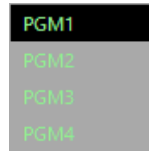
⚠️ **Note:** When *PGM4 Off Line* is not checked on any signal, this setting sets the bus that feeds the channel Bus-Minus signals regardless of whether the caller/remote channel is on or off. The board operator would then have to use the TB button on each caller or remote channel to talk to that caller or remote.

Direct Out Pre-Fader

When checked for the same channel numbers as set in the Bus-Minus/ Direct Out section, the Direct Out audio is sent at a fixed level (same level as the cue bus). When unchecked, the level feeding the Direct Out is controlled by the channel fader.
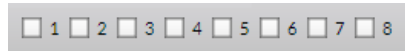
Direct Out Pre-On

When checked for the same channel numbers as set in the Bus-Minus/ Direct Out section, the direct out audio is not affected by the channel on/off status. The audio is always feeding the Direct Out unless *Direct Out Pre-Fader* is unchecked, then the channel fader affects the level going to the Direct Out. When unchecked, the Direct Out audio follows the channel on/off status.
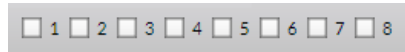
Monitor Config Page Tab

This page tab's settings affect the CR, STU, and HDPN monitor outputs on the Mix Engine. The Headphone settings also affect the board operator's headphone jack located in the right side-panel on the Surface.

Cue Defeat - When checked the cue system does not affect that monitor output. When unchecked, any channel with cue turned on gets switched into that monitor output replacing the monitor audio. The normal setting is

Cue Defeat checked for the Control Room and Studio and unchecked for the Headphone output (as shown in Figure 3-11, left illustration).

When cue is set to auto-switch into the board operator headphones (Headphone *Cue Defeat* unchecked), the *Split Cue* button in the monitor section on the Surface sets how cue is fed into the headphones. When the Split Cue button is unlit, cue is fed in stereo, cutting off the monitor audio. When the Split Cue button is lit, cue is fed to the left ear while the CR monitor source is fed to the right ear.

Level Locked - When checked, and the *Apply* button is then clicked, the current level for that level encoder (CR, STUDIO, or HDPN) is fixed at that output. Turning that encoder will no longer affect the volume for that output. Uncheck *Level Locked* then click *Apply* to return level control to that encoder.

Checking *Level Locked* might be used when a studio-mounted volume control (like that found in a TS22 talent station) is available, checking the Studio *Level Locked* would allow the TS-22 to control the monitor volume. The Headphone *Level Locked* would be checked when mics have talent stations or when an external headphone amp and cabinet-mounted level control/headphone jack panels are used.

Figure 3-11 Monitor Config & Buttons Page Tab Entries
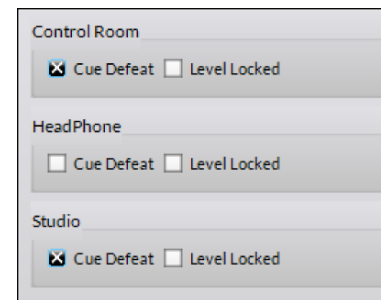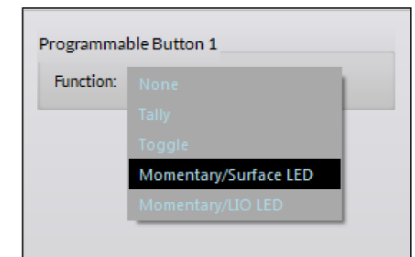
Buttons Page Tab

Figure 3-11, right illustration, shows the function choices in a drop-down list which can be assigned to the **Soft button** in the Surface's monitor section. After the function is selected, Navigator is used to configure the logic which has the functions: *Switch 1* and *Switch LED 1*. Here's what each function choice does and what they could be used for:

- **None –** The default setting. The switch and LED have no assigned functions and the button does not light when pressed.

- **Tally –** Sets the Soft button LED to function solely as an indicator with no switch functionality. Add a new logic-only destination in Navigator with the *Direction: input* and the *Function: Switch LED 1* (see *Assigning Soft Button Functionality* on page 41). The source

Spare01 is then connected to the new Logic-only destination in the Crosspoint tab. When that logic input is triggered, the Soft button LED lights up. This setting could be used to create a hotline phone ring indicator.

- **Toggle –** Sets the switch to function as a sustained mechanical toggle switch. A logic-only destination is created with the *Direction: output* and *Function: Switch 1*. The Surface itself controls the button LED, indicating whether the output logic is on (LED is lit) or off (LED is off). This setting could be used to control studio access (studio door locked = lit, unlocked = unlit) or used to bypass the console by using it to trigger a Momentary Connection (see *Using the Soft Button* on page 43).

- **Momentary/Surface LED -** Sets the switch to be momentary. A logic-only destination is created with the *Direction: output* and *Function: Switch 1*. The Surface controls the button LED, lighting it to indicate the button is being pressed. This setting might be used to create a talk button to talk to a call screener or to a producer.

- **Momentary/LIO LED –** Sets the switch to trigger a logic output while pressed and sets the LED to be controlled by a logic input. It combines the logic-only settings for Tally and Toggle. This setting could be used to create a profanity delay Dump button, with the LED being the Safe or Dump Ready indicator.

Visibilities Page Tab

At the top of each DMX fader channel is the channel encoder which can select a new source for that channel. There are also three source selectors in the monitor section to set the sources for the Switched Meter EXT button, the CR monitor source, and the Studio monitor sources assigned to that Studio EXT button. Each selector has their own **Visibilities List** to set which alternate sources are displayed when using each selector.

The default Visibility list for every selector is to list all sources. Desirable for installing and configuring the console, for daily operations it's essential these Visibilities lists—especially those on the fader channels, be edited to remove any signals which should not be listed, like the PGM buses and other internal console signals and non-air sources like a pre-delay processor output and off-air tuners.

Figure 3-12 shows the Visibilities page tab. The Channel 1 Source Selector is highlighted in the Source Selector list. That channel is typically dedicated to the board operator or the host mic. In the example, there are five sources checked: the left channel of the Analog In 1 jack (BL05MIC1), plus four *Alias* names and *Allow No Source*. Thus, when the channel 1 encoder is rotated with the channel off, **NoSource**, **BL05MIC1**, **GEORGE**, **JOHN**, **PAUL**, and **RINGO** will appear in the channel 1 display. Taking any source then displays that source name. In the case of the four aliases,

taking any of them connects the BL05MIC1 mic signal to the channel but the OLED display shows the alias or talent name.
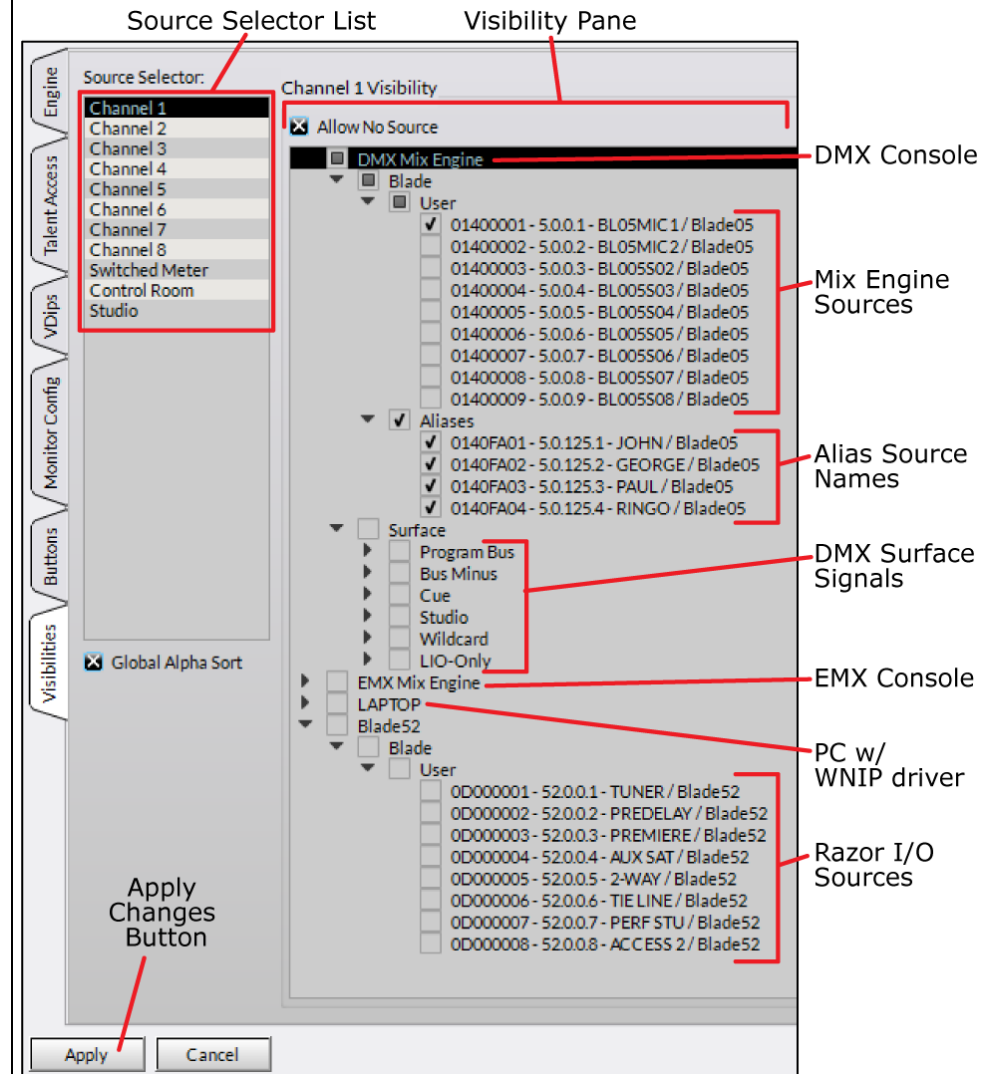
Figure 3-12 Visibilities Page Tab Settings

Taking **NoSource** is used to silence a channel. If *Allow No Source* is unchecked in the Visibilities tab, that name won't appear in the source list. This is typically done on the Switched Meter, Control Room and Studio selectors since they normally wouldn't be silenced at any time. It is typically left in channel lists since it can be used to identify when the include list has wrapped around and is again showing the top of the list of names.

The default Visibility setting, for every selector, is to display all sources. This is fine for setting up the console, but before it's released for daily operations, it's essential that the list of visible sources on the channels be edited—if only to prevent a Program bus from being taken on a channel. If this is done, and it's assigned to the same bus and the fader is raised, you'll get "digital feedback" which will overload the bus, causing it to mute. Therefore, *Surface* is typically unchecked for all fader channel selectors.

Visibility Lists

On fader channels with a dedicated source, like the Host mic or phone channel, only one source, or maybe several talent name Aliases are checked along with **NoSource**.

On media server playback channels, there is often a B Serve or backup server, so typically the main and B Serves on the media server channels are checked. On fader channels with sources which get used periodically, like a CD player, checking a handful of alternate sources adds flexibility to those non-dedicated fader channels.

Many users set up the last two or three faders near the monitor section as "remote line selectors" which typically have every source checked which might go live to air or need to be recorded. Of course, these lists would still exclude the Surface signals and sources like off-air tuners and processed pre-delay monitor signals.

Caller & Remote Visibilities

In earlier Audioarts consoles Telco devices (commonly referred to as callers and remotes) could only connect to the "Phone channel." The phone channel often could only be assigned to one bus at a time since the bus selection also controlled bus being sent back to the caller (the return or mix-minus audio) minus their incoming audio.

On the DMX, since every fader channel creates its own bus-minus signal, which is typically used as the return signal for each caller or remote, this means there are no channel restrictions so a caller or a remote can be set as visible on any fader channel.

However, when a caller/remote is set as visible on multiple channels, when it's taken on a channel, that channel's bus-minus signal must then be connected back to that caller or remote. This can, of course, be done manually in Navigator, but it can also be done automatically by creating an *Associated Connection* for each caller or remote device and for every channel that they are set visible on. Page 35 has for an overview of using Associated Connections with callers and remotes.

Setting the Visibility List

Click on a name in the *Source Selector:* list. That Channel number, Switched Meter, Control Room, or Studio is highlighted, and the current

visibility settings are shown in the *Visibility Pane*. The *Visibility Pane* title shows the highlighted selector's name (Figure 3-13).

When the app is opened, Channel 1 is selected, and the system devices are all collapsed with a check box indicating whether any sources are selected on each device. An empty box means no signals are selected; a filled box means at least one signal is selected; and a checked box means every signal on that device is selected. On a new console every device will have a checked box making every signal visible on every selector.

To expand a device, click its right-facing arrow. The arrow then points down and sub-categories (Blade, Surface, etc.) are then shown. The sub-categories are then expanded in like manner until you reach the User and Alias sub-categories. A device, or one of the sub-categories, are collapsed by clicking their down-facing arrow, which then points right again. The current view is maintained until the app is closed. Reopening the app will again show all devices as collapsed.
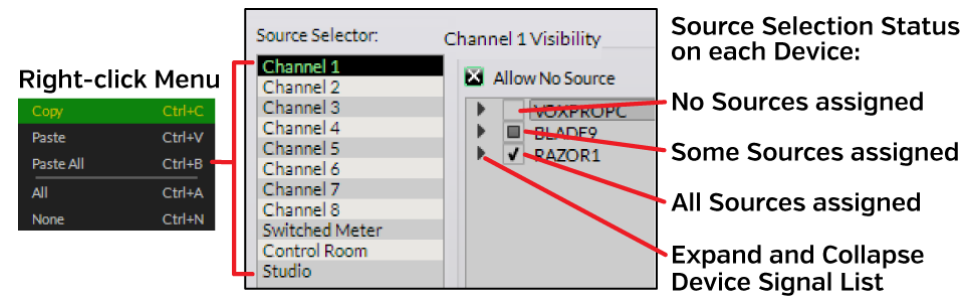

Figure 3-13 Visibilities Controls

Visibility Pane

Figure 3-12 (page 29) shows the expanded sources for a DMX console (Mix Engine and Surface) and a Razor Interface. Two other devices, a console and a PC with AoIP driver, are shown collapsed. The Program buses and other internal bus signals appear under the Surface sub-category below the Mix Engine. These signals are all normally **unchecked** on channel selectors, but most may be left visible on the monitor and meter selectors.

When the User and Alias sub-categories are expanded individual signals can be checked to set that signal as visible on the active selector. Unchecked signals will not appear as an alternate source on that selector.

The *Allow No Source* selection is checked by default so that **NoSource** is available to silence a channel. It also serves as a handy signal list divider allowing an operator to tell when the signal list has wrapped around since NoSource is the top name in each list. Un-check *Allow No Source* on the monitor and meter selectors since one typically does not want to silence the monitors or the switched meter.

The *Source Selector:* channel, switched meter, and monitor selectors each have a right-click context menu (Figure 3-13) to allow the visibility setting from one selector to be copied and pasted into another selector. After setting a selector's visibility list, right-click on its highlighted selector name and select *Copy* then right-click on another selector and select *Paste* to update that selector's settings.

⚠️ **Note:** There is also a *Paste All* selection in the context menu. Selecting this pastes the copied list of sources to every channel, meter, and monitor selector.

Once the signal visibilities are set, whether for one channel or for all channels, click *Apply* to transmit the changes to the Surface. The source selectors will immediately update to use the new visibility lists.

Global Alpha Sort

This option is typically checked so that the visible source names are listed in alphanumeric order, regardless of which device the source is physically on. As each source name is highlighted, the name of the device it's on is shown above the white line. This allows sources with the same name, like PGM 1, but which are on different devices to be identified without having to assign every signal a unique name. Identical source names, even if on the same device, will still appear as separate entries in the list, but we recommend trying to use unique names—if only to make it easier for board operators to select the correct source.

When unchecked, sources are sorted and listed alphanumerically by their device. The devices are listed in Blade ID number order. Thus Blade 1's sources will be listed in alphanumeric-order first, then Blade 2's source names would be listed, then Blade 3's names, and so on.

THE NAVIGATOR APP

Navigator is initially used to edit the names and configure the input and output signals on all the Mix Engines, Razors, and Blades networked together to form a WheatNet-IP system. This can be done without obtaining a Navigator license, but to access advanced features, like updating Mix Engine, Razor, and Blade software, you must have a Navigator license. A 30-day demo license is included with your DMX. Email techsupport@wheatstone.com the Seed ID, obtained from Navigator, to receive a demo license. Contact your Audioarts dealer or Wheatstone sales about purchasing a full Navigator license.

Once the audio and logic signals are configured, Navigator will mainly be used to connect sources to destinations using the Crosspoint and Salvos/Macros tab. Here are some of Navigator's main functions:

- Setting the mode for physical inputs and outputs (mono, stereo, and 5.1 surround are supported)

- Editing names of system sources and destinations

- Viewing and updating the Mix Engine and Razor software

- Manually configuring system devices

- Setting up weighting so specific Blades will be set as the system master or clock master in a multiple-console system

- Assigning system-wide settings like the sample rate and the date/time shown on the DMX Surface monitor displays

- Assigning functions to the LIO (the RJ45 LOGIC connectors) and to SLIO (Software Logic I/O) available on each device

- Creating Associated Connections to automatically make signal connections in response to a triggered connection

- Viewing the devices connected in the system

- Logging system activity

To start Navigator, double-click its desktop icon or, from the Start Menu, select WheatNet IP Navigator from the Wheatstone folder.

WheatNet IP Navigator, henceforth known simply as Navigator, opens showing the **Crosspoint Tab** (Figure 3-14 on the next page). A Login popup box also appears. When first using the app, click *OK* to close the popup since no password is set by default. We do recommend setting a password (click *Set Password…* on the popup window)—especially when Navigator is being run on a studio PC since unexpected audio connection changes and other undesired operation could occur if the app is used by an untrained operator.

System Tabs

The **System > Crosspoint tab** is the most often used tab, which is why it's shown when the app starts. Clicking on a different tab; on a different Page Tab; or on a Blade, a Surface, or other device icon in the System Dock, switches the window from showing the Crosspoint grid. To redisplay the Crosspoint Grid, click the System icon at the top of the System Dock, or the *System page tab*, then click the *Crosspoint tab*. A floating Crosspoint Grid window can also be opened by clicking the *X Point* window selector.

The Crosspoint grid shows the system sources on the horizontal axis and system destinations on the vertical axis. The colors of the signal names match the device colors shown in the System Dock. The assigned colors can be edited using the *Blade Preferences* section of the **System > Preferences tab**.

Icons in the XY grid indicate connected signals. Audio connections are shown by small round balls. Their colors indicate the signal level with purple indicating no or very low signals; green being a normal level signal; and red being a high-level signal (these default colors can also be edited in the Preferences tab).

A small green square on a cross point indicates a logic-only connection. A single ball on a crosspoint indicates a mono source and mono destination connection. Two balls at a 45° angle indicate a stereo source and stereo destination connection. Two balls stacked vertically indicate a mono source connected to a stereo destination and two horizontal balls indicate a stereo source connected to a mono destination. A large blue multicolor ball indicates a 5.1 connection, rarely used in radio but often used in TV. The ball can also show various colors indicating the various 5.1 channel levels.

If clicking on a crosspoint yields a large gold circle, that means the destination could not subscribe to that source, which typically means there's a system fault. But, on a DMX this can occur when the built-in Ethernet switch is networked to other devices, but the switch has not been
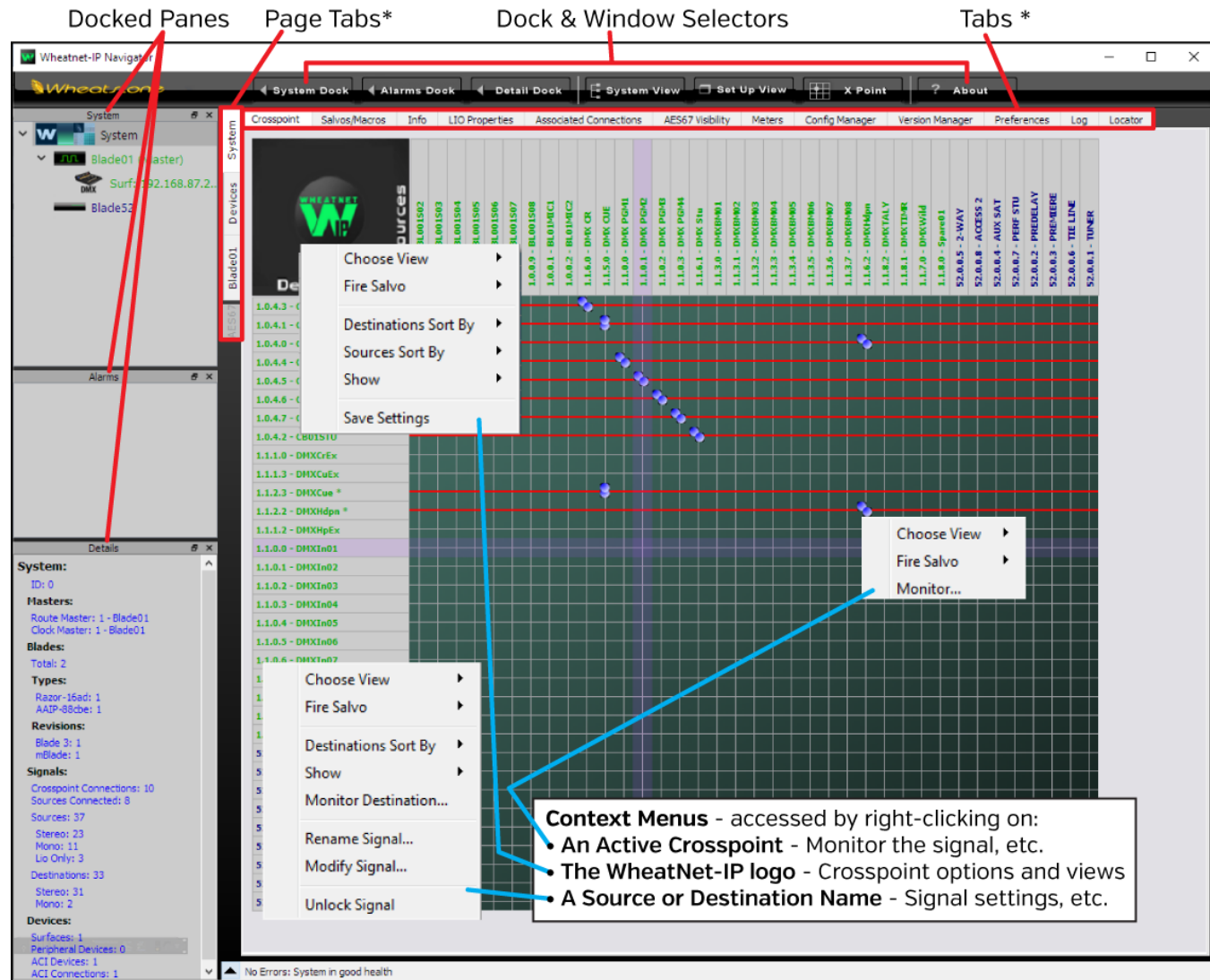
Figure 3-14 Navigator Controls Overview

configured to receive IGMP messages. Conversely it can also indicate that a stand-alone console's switch was configured to receive IGMP messages, but there's no external managed switch connected to the Mix Engine. In either case, this indicate the built-in Ethernet needs to have its configuration edited. Appendix A (page 61) covers how to use a Netgear app to edit the Mix Engine's switch configuration to either turn on or turn off IGMP support.

Connecting Signals

When the mouse pointer is moved over the grid, purple XY crosshairs point to a source and a destination to better identify which signals will be connected when you click on that grid crosspoint. This is shown in Figure 3-14 on the last page. Clicking on a cross point then adds an icon to the grid to indicate that connection is now active. To disconnect a signal, click on an active crosspoint to silence the destination on an audio connection, or to turn off the logic on a logic crosspoint.

⚠️ **Note:** As a safeguard, to prevent accidental connections and disconnections, require that the CTRL key be pressed while clicking on the grid to make or break a connection. This option is set in the *General* section of the **System > Preferences tab**.

A destination with a horizontal red line across the grid indicates that destination is locked from being easily changed, which typically indicates it is actively being used. Locked signals may be system-assigned (like PGM 1 being cross connected to the PGM 1 output) or they indicate Surface fader channels which are currently turned on. Regardless, any locked signal can be unlocked by right-clicking on the Destination name and selecting *Unlock Signal* from the context menu (shown in Figure 3-14 on the last page).

⚠️ **Note:** Use caution when unlocking DMX channel destinations DMXIn01 – DMXIn16, since those red lines indicate a fader channel that's currently turned on. This is also the case with dedicated outputs feeding air or going to an internet streamer since changing their sources would affect your air or stream feeds.

Remote Monitoring of Audio Signals

Right-clicking on an active crosspoint connection, on a source name, or on a destination name brings up a context menu (as shown in Figure 3-14 on the last page). Selecting *Monitor…*, *Monitor Source…*, or *Monitor Destination…* opens a Monitor window (Figure 3-15) showing the source levels and, if that signal is connected to a Destination, the Destination levels.

The bottom section of this window has controls to listen to that audio. A drop-down list sets which PC audio destination to use to listen to the signal (typically the PC's built-in speakers). Click *Listen to Source…* to hear the audio in your PC speakers or headphones. Use the *Volume* control to adjust the listening level.

⚠️ **Note:** This monitoring feature is even more valuable when you remote into the system from home or the road since the audio plays back on the remote PC allowing one to confirm the correct audio is present. For remote access into your admin PC, we recommend using TeamViewer.
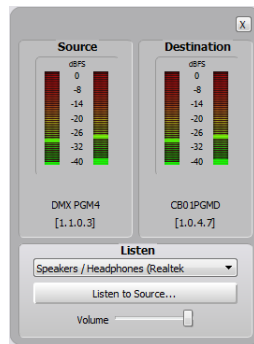

Figure 3-15 Signal Monitor Pop-Up

Salvos/Macros Tab

Clicking the **System > Salvos/Macros tab** shows a display that looks like an unpopulated Crosspoint grid. The difference is that this grid is not "live." In the Salvo grid (Figure 3-16) the signal connections needed for a future show, a new daypart, to setup connections on a Blade, or to setup for a special event, are saved as a Salvo. That Salvo can later be "fired" to immediately make the various crosspoints saved in that Salvo.
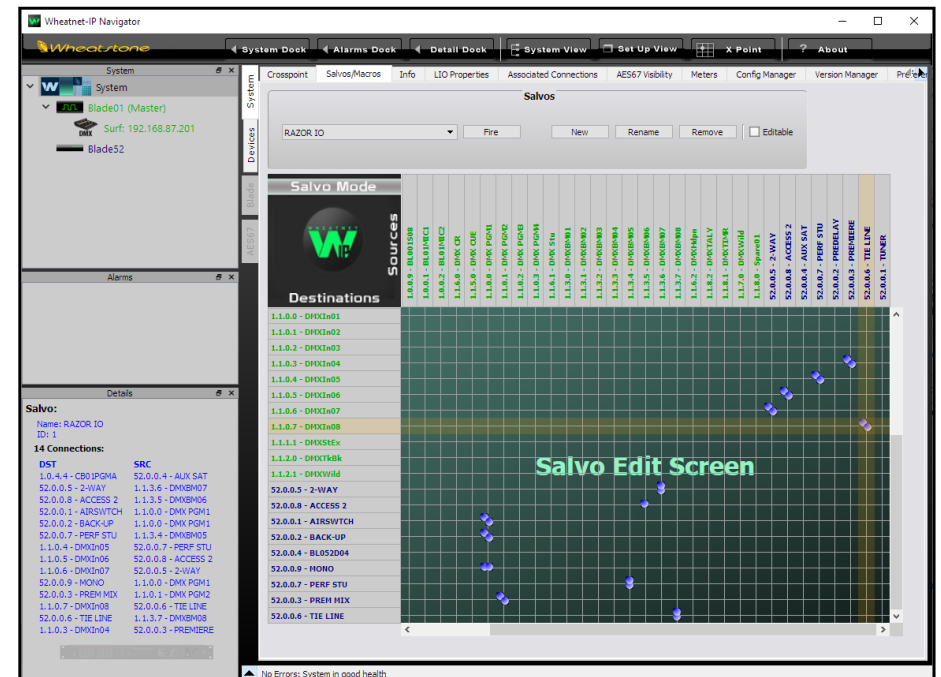

Figure 3-16 Salvo/Macro Tab

Dozens of audio and logic crosspoints can be set and saved in dozens of Salvos. Every Salvo begins life as a number (Salvo 1, Salvo 2, and so on), which doesn't mean much, so you'll want to immediately rename any Salvos you create. In Figure 3-16, Salvo 1 was renamed as RAZOR IO by selecting that Salvo in the drop-down list then clicking *Rename*. Be sure to use a name that easily identifies the Salvo. Even though you can enter a Salvo name using an almost unlimited number of characters, only about 25 characters are shown in the Salvo drop-down list. However, when assigning a Salvo to a programmable button in the LIO tab, only the first eight characters will be shown, so it's best to limit your names to eight characters, like: RAZOR IO, DanceRMT, SuperPre, or GrdnShow, or at least make sure the first eight characters identify the Salvo using a longer name.

Click *New* to create a new Salvo with the name *Salvo X (empty),* with X being the next unused Salvo number. Any existing connections from a

previous Salvo are removed so you have a clean slate. As soon as you make the first connection "(empty)" is removed from the name indicating that Salvo is in-use. There's no Save Salvo button since the active Salvo is updated with every edit.

When you select a Salvo in the drop-down list, its connections are shown in the Salvo Edit Screen in read-only mode. The **Details Dock** also lists that Salvo's connections by their destination and source signal numbers and names. If you want to make changes, click the *Editable* button, then you can add or remove crosspoints.

To take a Salvo, select it from the drop-down list then click *Fire*. The crosspoints assigned in the Salvo are all immediately connected—except for any connection going to a locked destination, like channels that are turned on. To make those connections, turn off the channel(s) or unlock locked destinations, then fire the Salvo again. You can also assign the Soft button, in the monitor section of the DMX Surface, or a button on a programmable button panel, to fire a salvo.

Info Tab

This tab (Figure 3-17) has three sections, highlighted, which may need to be checked and/or set. In the **Set Date and Time** section check *Use this PC's time* then click *Apply* to update the date and time on the monitor OLED displays to that PC's date and time. If the PC running Navigator is also connected to the Internet (using a separate NIC), click the *NTP* radio button then select a remote time server to keep the system time synchronized.

⚠️ **Note:** If the Mix Engine is power cycled, or the Surface is rebooted, the date and time must be manually updated again.

In the **Clock Master Info** section, check that the *Clock Master Frequency* is properly set. The default setting is 44.1, but this can be changed to 48 kHz (needed by some audio playback systems) by clicking the 48 kHz radio button.

If there are any Razor Interfaces in the system, the **Blade Display Settings** section is used to control the brightness of the front panel OLED display. There is no *Screen Saver* on the Razor so that setting is not applicable to a Razor, but the *Brightness*, *Dim Brightness*, and *Screen Dim* are set like setting up the OLED displays on the DMX Surface Setup app.

The remaining sections on this tab are not applicable to a stand-alone DMX. Refer to the WheatNet-IP System User Manual about the other settings on this tab.
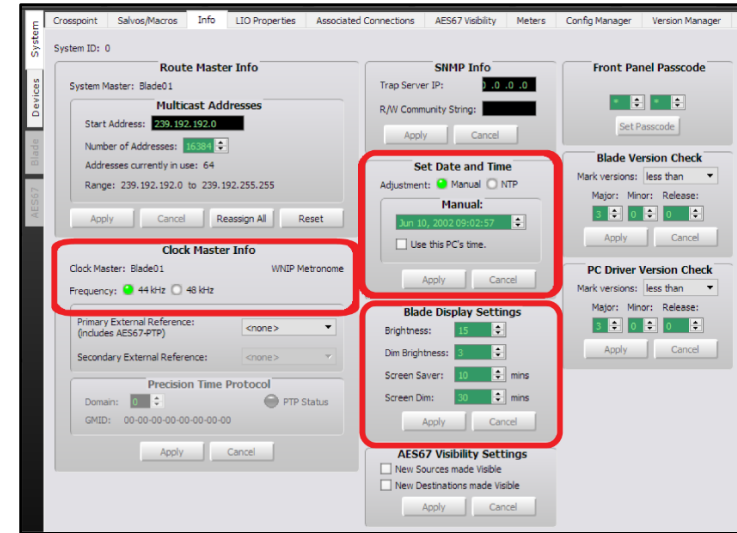
Figure 3-17 Info Tab

LIO Properties Tab

This tab (Figure 3-18) can be used to set the unconnected state condition for the User-defined logic functions (User 1–User 500). Each User-defined logic function can be set so its unconnected state is High, Low, or leave it in its Last State when disconnected. The default setting is *Low*. This tab also shows the unconnected state settings for the pre-assigned logic functions, but none of those settings can be edited.

Figure 3-18 LIO Properties Tab

Associated Connections Tab

This tab is used to create, view, and edit Associated Connections. An Associated Connection can be used to automate common system connections by monitoring for a **Trigger Connection** to occur. When this occurs one or more **Associated Connections** are then made.

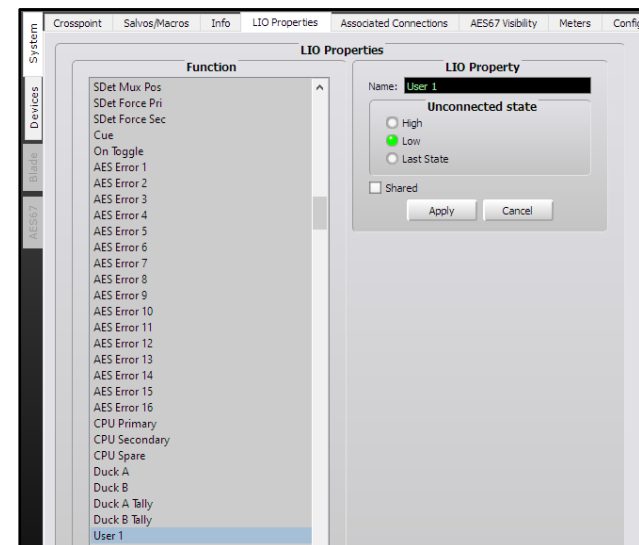A typical use for an Associated Connection (AC) is to automate connecting a bus-minus signal to a caller or remote by creating an AC for each channel that a caller or a remote is visible on. The Trigger Connection occurs when the board op takes the caller or remote on a "trigger channel." The Associated Connection then connects that channel's bus-minus signal to the caller or remote.

This type of AC is shown in Figure 3-19, but one can automate many system operations in response to a predefined trigger connection. It can even be triggered by a Disconnect, like removing a crosspoint or taking NoSource on a fader channel. Additional details on Associated Connection applications can be found on page 43.

Setting up an AC is a four-step process, as shown in Figure 3-19. In the tab's **Triggered Connections** section, click the *Add…* button (1) to open the *Add Triggered Connection* dialog box (2) where a source and destination are selected. In the example, the triggered connection is the PHONE being taken on channel 8 (DMXIn08). Clicking *OK* adds that entry to the Triggered Connections list and closes the dialog box.

Click on the Triggered Connection to highlight its row then click the *Add…* button in the **Associated Connections** section (3) to open the *Add Associated Connection* dialog box (4) to select the source and destination you want connected when the trigger connection is detected. In most cases you'll want to checkmark the *Lock Override* option. When it's checked, and the trigger connection is detected, the selected source is connected to the destination regardless of whether that destination is locked. When *Lock Override* is not checked, the Associated Connection will not be made on a locked destination.

As shown in Figure 3-19, multiple Associated Connections can be assigned to the same trigger. In the example, when the PHONE is taken on channel 8, the channel 8 bus-minus signal is connected to the PHONE plus the caller and host mic audio are connected to a VoxPro editor (the host mic, BL01MIC1, connects to the left channel and the incoming PHONE audio connects to the right channel of the VoxPro output).

Once you setup all the Associated Connections, click the all-important *Apply* button, at the bottom of the tab, to tell the system to start monitoring for that Trigger Connection. You would then repeat this process for any other channels that the PHONE is visible on so the correct signals are always returned to that caller regardless of which channel it is taken on.
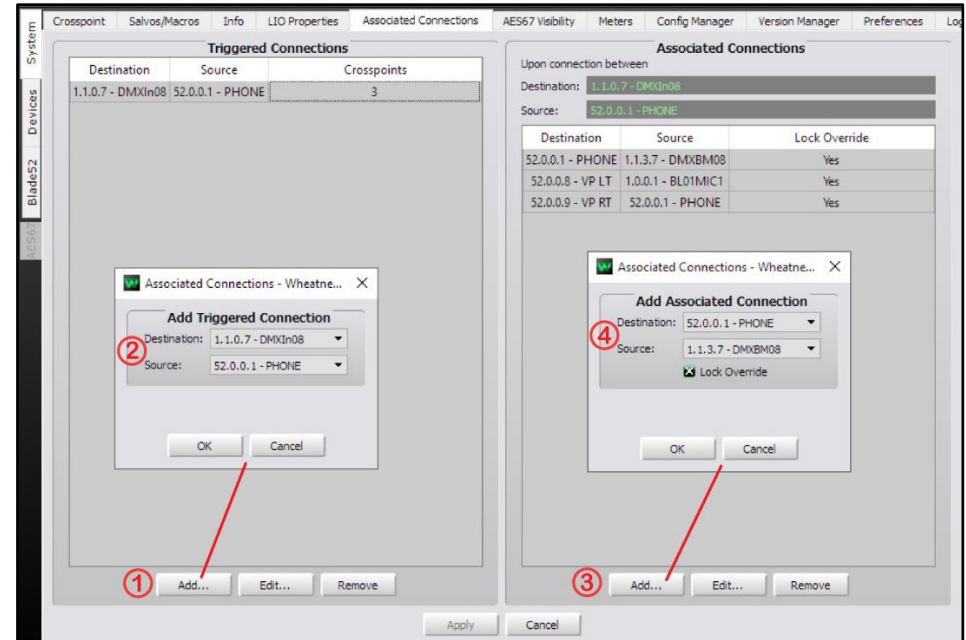

Figure 3-19 Associated Connections Tab

AES67 Visibility

This tab (Figure 3-10 on the next page) sets which WNIP system signals will be transmitted to AES67 devices and which WNIP destinations can receive an AES67 device stream. This tab is not used unless Navigator has an AES67 License; there is at least one Blade-3 Blade in the system that can be designated as the "AES67 Translator;" and there are AES67-compatible devices networked with your WNIP network.

Sources and Destinations are selected as used for the Visibilities tab in the DMX Surface Setup app (see pages 29 and 30 for signal selection details). When a source is set as visible, and *Apply* is clicked, the selected audio is connected to the "AES67 translation Blade" in preparation for being streamed out to an AES67 device. This means that checking a lot of signals could cause audio streaming traffic issues and even when the network is properly configured, one could run out of bandwidth. The bottom line: select only those signals which need to stream out to AES67 devices.

The same hold true for Destinations that will receive streamed audio from the AES67 translation Blade. For more details about networking AES67 devices with a WNIP system see the Blade-3 User Manual or the Commissioning AES67 White Paper (both available for downloading from the main Wheatstone web page under Support & Downloads).
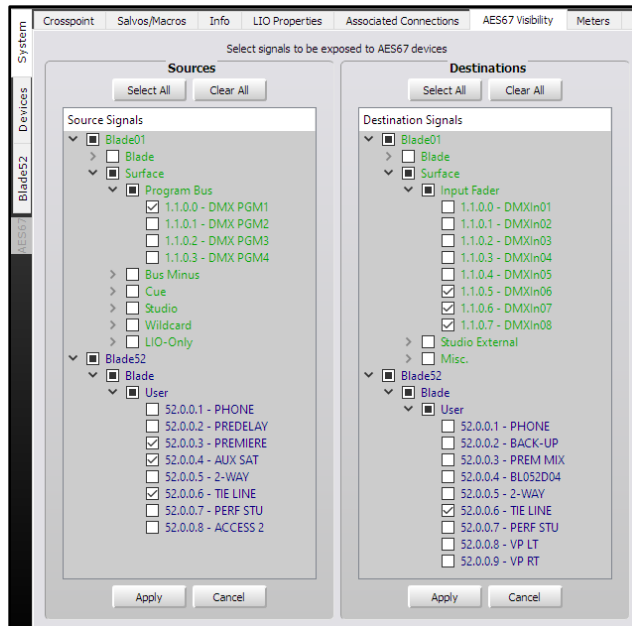
Figure 3-20 AES67 Visibility Tab

Meters Tab

This tab (Figure 3-21) can have up to 64 meters, selected to show levels for any combination of system sources and destinations. The only signals which can't be metered are Mix Engine destinations like console fader channels and external monitor inputs, and AES67 signals. The meters are shown in rows of eight meters. Mono and stereo signals each take up one meter space. A 5.1 signal meter takes up three meter spaces.

Figure 3-21 Meters Tab

The meters are created when a signal is checked in the Meters Sources and Destinations lists so it's best to map out how to group the meters before beginning to select them. To remove a meter uncheck the signal in

the Meter Source and Destination Signals lists. Since the remaining meters are not rearranged, you'd need to checkmark another signal to fill in any gaps opened by deleting meters.

This tab is especially useful when accessing the system remotely since one can see signal levels from multiple devices immediately, as opposed to having to select a Blade and then view the Sources or Destination tab to view signal levels. The Meters tab can also be set as a Floating Window by clicking the Float button in the upper right corner. To re-dock the tab, click the Unfloat button.

Config Manager Tab

This tab (Figure 3-22) is used to create a backup of the configuration settings for an entire system and to then restore the settings on one or all devices. Even though Blades have the configuration settings for all other Blades, it's important to periodically save a system backup—especially after you finish completely setting up a new system, so that your settings are saved in case they need to be restored to any system device due to a device failure requiring it to be replaced or if a factory reset of a device needs to be done for some reason.
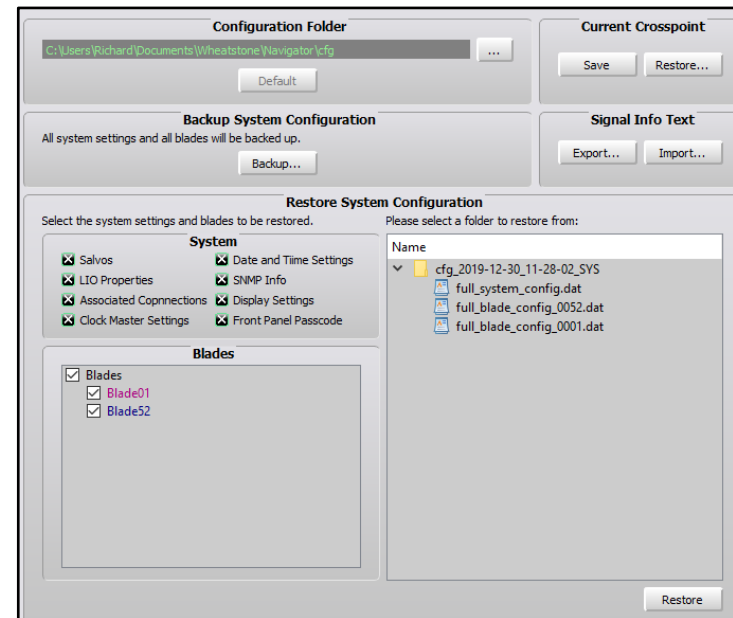

Figure 3-22 Config Manager Tab

The **Current Crosspoint** section of the tab allows the current crosspoints to be saved to a file which can be used to restore all crosspoints at a future point in time. (The *Save* button is not shown until the System > Preferences tab option *Enable Advanced Controls* is checked.)

Clicking *Save* saves the current crosspoints to a file, named by the saved date and time, in: Documents > Wheatstone > Navigator > Connections. Immediately after saving a crosspoint file click *Restore…* to open a dialog box. You can then edit the file name by the activity, show, or daypart so that when you use the Restore function, you'll be able to select the correct file.

There's one important caveat to using *Restore Crosspoint* versus using a Salvo to take multiple crosspoints: Restore overwrites locked signals—including ones locked because a channel is currently on-air, whereas taking a Salvo will not change the source on a locked destination.

The **Configuration Folder** section sets the folder path for saving your device configuration files. Clicking the *…* button to open a save dialog box so you can change the path as required. Clicking the *Default* button restores the Configuration folder back to using the default path.

The **Backup System Configuration** section allows all system settings to be backed up by clicking *Backup…*. A pop-up warning box appears listing the filename, which includes the date and time. Clicking *Yes* saves a separate Config file for each blade within a System Backup folder. The saved configuration folders are listed in the **Restore System Configuration** section of the tab. Each system folder can be expanded to view the individual system device files, which are named by device number.

The **Restore System Configuration** section is used to restore a saved configuration. The check boxes, in the **Restore** section, allow you to select which system devices and settings will be restored when the *Restore* button is clicked. Click on the name of a saved configuration folder and then click *Restore* to restore the configuration settings held in that saved configuration folder. Once the settings are restored, any Blade that is being restored must be rebooted in order to use the restored settings.

Version Manager Tab

This tab (Figure 3-23) is used to update the operating system code on Mix Engines, Razors, and Blades either individually or all together. When Navigator was installed, the current release of the WNIP operating system code was also copied to the PC, but an updated code file may also be available separately.

⚠️ **Note:** Updating the operating system code requires that Navigator is licensed. Contact Wheatstone support to obtain a license if there are no.

In the **Blades available for update** section, checkmark which Blades to update. Blades can be updated one at a time or all at once. Click *Select All* to checkmark all Blades. Click *Clear All* to uncheck all Blades. Once the Blades you want to update are checked, click *Update…* which opens a dialog box to select the binary code file holding the updated code files. In most cases there will only be one file in the directory which has the

version of that code in its name. Select the file and click *Open* to load that file. A warning dialog box pops up asking the age-old question: *Are you sure?* Click *Yes* to load the new code or *No* to cancel the update.
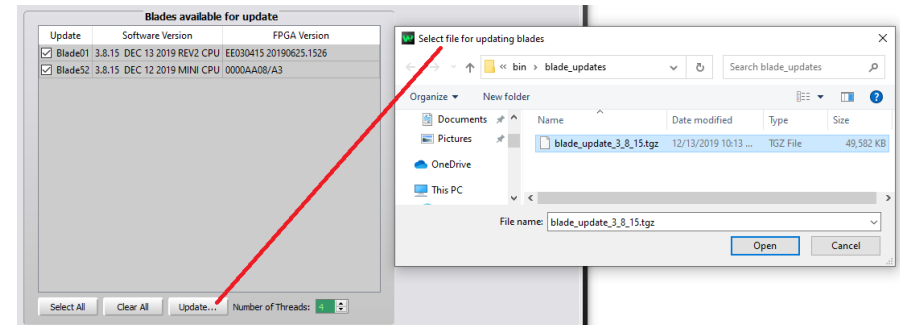
⚠️ **Note:** There will be no audio interruptions when the code is uploading, but you must reboot the Blade to then run the updated code. Rebooting a Blade will cause momentary audio interruptions on each Blade as it completes rebooting and remakes all of its existing connections.

Preferences Tab

This tab (Figure 3-24 on the next page) sets Navigator's appearance and some of its functionality. The **General** section **Default View:** sets whether the default crosspoint view (*No View*) or a custom view is shown when Navigator opens. **Default Grid Labels:** sets how the source and destination names are listed as: name only; names and location; name and signal format; or signal ID and name. The **Default Sort Order:** section sets the order in which the Source and Destination names are displayed and how the Blades they are on are listed in the grid.

The five check boxes at the bottom of the **General** section set: how Source and Destination signal ID numbers are shown (**Use dotted Signal IDs rather than hexadecimal**); the overall look of the Navigator app (**Use Style Sheet**); whether 12-hour or 24-hour is used in Navigator (**Use 24 Hour Time**); how a crosspoint connection is made or broken (**Use CTRL+click to make/break a crosspoint connection**); and whether to show the **Logger** section (**Enable Advanced Controls**).

The **Blade Preferences** section allows each Blade's color to be edited by double-clicking on a Blade Name. A *Select Color* window opens so a new color can be assigned to that Blade. The color setting not only affects the color of the Blade names in the dock, it also affects signal name colors in the crosspoint and salvo tabs, and the color of log entries from that Blade. Since System Announcer log messages are black, we don't recommend assigning that color to a Blade.

Figure 3-24 Preferences Tab with Advanced Controls Enabled

The **Crosspoint Preferences** section allows one to customize how the Crosspoint grid looks. You can change the color of the normal pointer crosshairs (**Grid Hilite**); the color of the crosshairs when over a crosspoint with Associated Connections (**Assoc Hilite**); the color of the audio connection balls from their default purple, green, and red; the color of the logic connections from the default green; and change the grid background and grid logo.

The *Default Crosspoint* button allows you to return the settings to their defaults after "customizing" didn't work out the way you thought it would. The Salvo crosspoint display can likewise be customized as well, knowing the *Default Salvo* button can be pressed to return it back to its "stock" settings.

The **Logger** section is only shown when *Enable Advanced Controls* is checked in the **General** section. These settings affect the System Log operations and the **Log** tab. We recommend using the default settings, but if a change is made, clicking *Set* applies the updated settings. Click *Open* to open the E2Logs folder which is where the various types of log files (text files) can be viewed.

The **Network** section shows which NIC Navigator expects is connected to the WNIP network. If no devices appear in the System Dock, look at the NIC address shown here. If it's not correct, click *Set…* to open a dialog box listing all of the PC's NICs so the correct NIC, which should be an address in the 192.168.87.0 subnet, can be selected.

Log Tab

The Log tab (Figure 3-25) shows system messages, sent by the WNIP devices, by date and time. Its main purpose is as a troubleshooting tool, although you can get a good sense of network communications by observing the log as the system is in use.
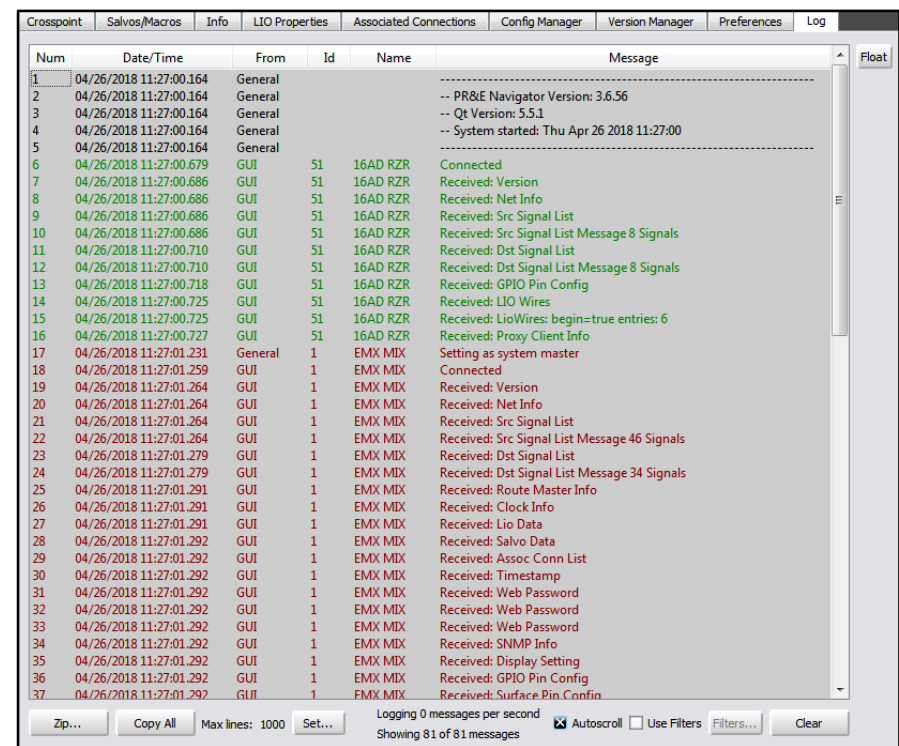

Figure 3-25 Log Tab

The log information shown in Navigator is generated by the WheatNet IP Logger service which runs on any PC that has Navigator installed. Although Navigator doesn't have to be running to save the log, a PC with Navigator installed on it would need to be connected to the WNIP network, and would need to be operating, for a system log to be generated.

Locator Tab

This tab (Figure 3-26) shows all Blades, Surfaces, and other devices connected to the WNIP network. Click *Refresh* to rescan the system and refresh the view. Note that a similar view is obtained by clicking on *System View* but in that view the Surfaces are shown under a separate tab from the Blades.

Just as with the DMX Surface Setup Locator screen, clicking on a device lists its properties in the **Set Selected Device Properties** section where the settings can be viewed and manually edited, if required. Typically editing these settings will require that device to be rebooted before the new settings are used.
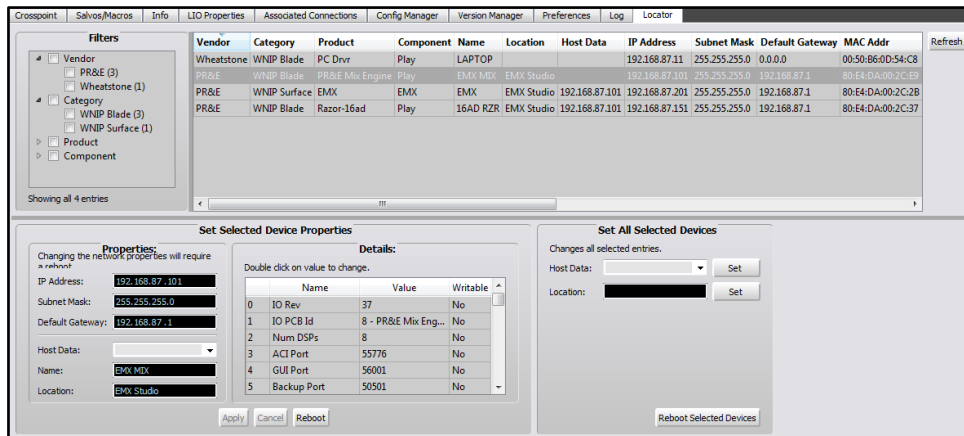

Figure 3-26 Locator Tab

Blade Tabs

When a Mix Engine, Razor I/O Interface, Blade, or a PC or audio server with a WNIP driver icon is clicked on (selected) in the System Dock, the list of tabs change from those shown while System is selected. The **Blade tabs** for a Razor is shown in Figure 3-27.
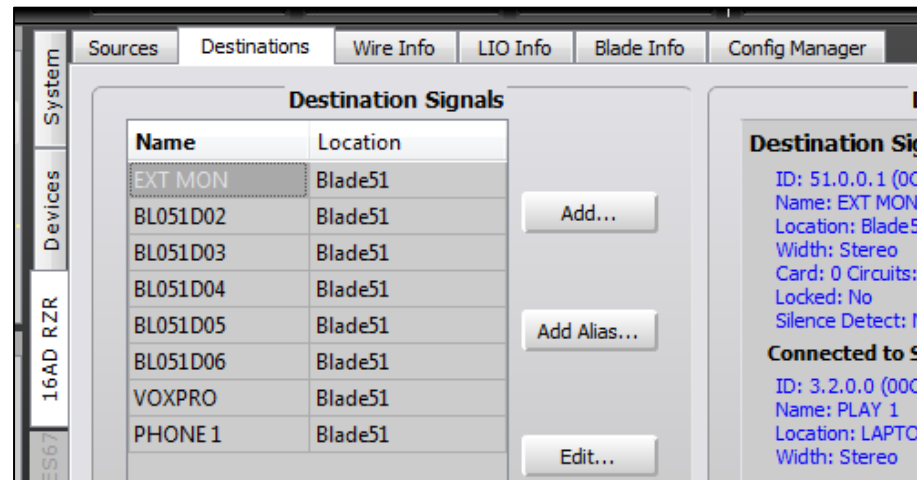
Figure 3-27 Blade Tabs

The Blade tabs allow one to update the settings for that Blade's input signals (**Sources tab**); its output signals (**Destinations tab**); to save and/or print out a list of input and output connections (**Wire Info tab**); to view and test the device's logic connections (**LIO Info tab**); to view and edit the Blade network settings (**Blade Info**); and to save or restore that Blade's settings (**Config Manager tab**). The M4IP-USB and other Blades have additional tabs: **Silence Sense** and **Utility Mixer**.

Sources & Destinations Tabs

These two tabs have identical sections. The tabs are used to edit the Source or Destination names, delete and add new signals, edit a signal's format, add logic commands and associate them with a particular audio signal, add and edit logic–only signals, create signal Aliases, and edit the Blade's location name.

The full Sources tab is shown in Figure 3-27. The lower half of each of these tabs (the **Meters** section) shows signal levels for the physical inputs (on the Sources tab) or outputs (on the Destinations tab) on that Blade. Just below the meters are level controls and, for stereo signals, a balance control. The level controls allow each signal level to be adjusted by up to +/-18 dB from nominal. Details on using the level and balance control can be found on page 41 in the *Level & Balance Controls* section.

Figure 3-27 Sources Tab

Naming Signal Inputs and Outputs

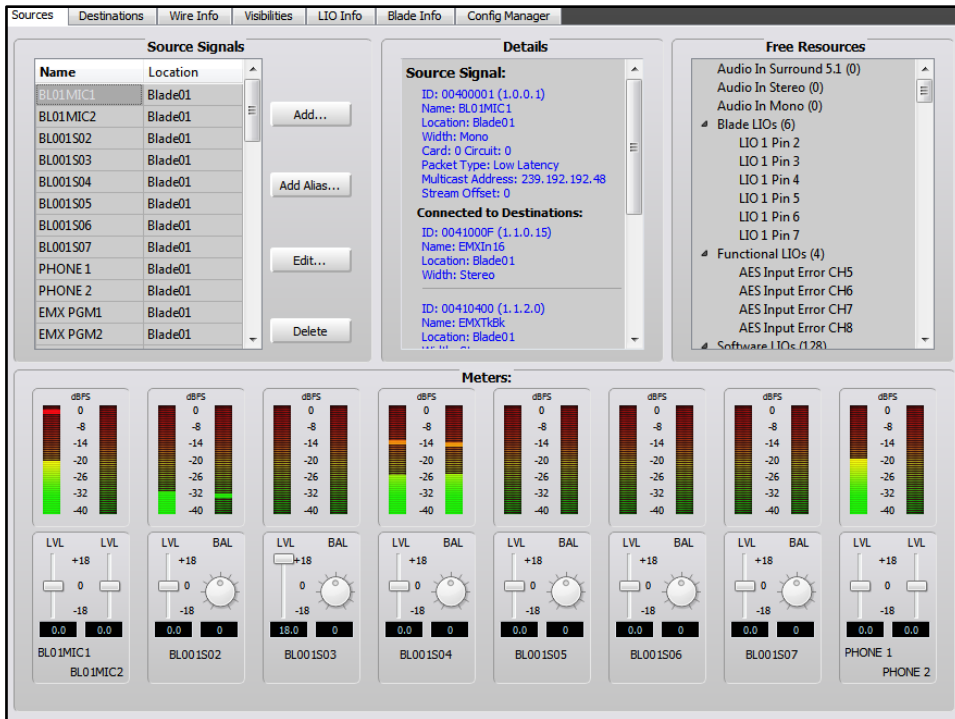Every Blade input and output signal has a default name which can be edited using the **Blade > Sources** or **Blade > Destinations** tab to identify the peripheral device or the signals connected to the various inputs and outputs. The internal signal names for the PGM buses, console fader channels, the bus-minus signals, etc. are typically left using their default names.

As an example of how to edit names, the Mix Engine Analog In 1 signals have the default names of BL01MIC1 and BL01MIC2 since those two inputs are meant to jumper to MICS OUT. These two signal names might be edited to MIC 1 and MIC 2 or to HOST and GUEST (any name using up to eight characters). Input signals are edited using the **Sources tab** (Figure 3-27). To see this tab, click on the Mix Engine icon (Blade01) in the **System Dock** then click the **Sources tab**.

To edit the name, click on the name in the **Source Signals** section of the tab then type in a new name of up to eight characters. You can alternately click once on the name then click *Edit…* to open the **Signal Edit** window (shown in Figure 3-28) and edit the name in that window. Shown by the red outlines.

Changing the Signal Type

If you aren't planning on using the two built-in mic preamps on a Mix Engine, or on an Analog-only Razor, two other mono sources, like a pair of phone hybrids, or a phone hybrid and a codec, could alternately connect to Analog In 1. If no mono signals are being connected, the two mono Analog In 1 signals can be changed into a single stereo input by clicking on BL01MIC2 in the *Source Signals* list to highlight it, then clicking **Delete** to remove that signal—after clicking *Yes* on the "Are You Sure?" pop-up box.

Click on the other mono signal (BL01MIC1) to highlight it and click **Edit…** to open the edit window (Figure 3-28). Change the **Signal Type** selection from Mono to Stereo. You can then edit the name back to a generic name, like BL001SO1, to indicate Analog In 1 or, if you know what stereo device will connect to that input, enter the device name in the *Name* entry box. Click *Finish* to close the Edit Window.

⚠️ **Note:** You cannot edit a source or destination signal while it's connected in the Crosspoint grid. When the **Signal Edit** window opens (Figure 3-28) look at the bottom of the window to verify it shows "Signal is not connected." If it shows "Signal is connected" you won't be able to make any changes to that signal other than editing its name.
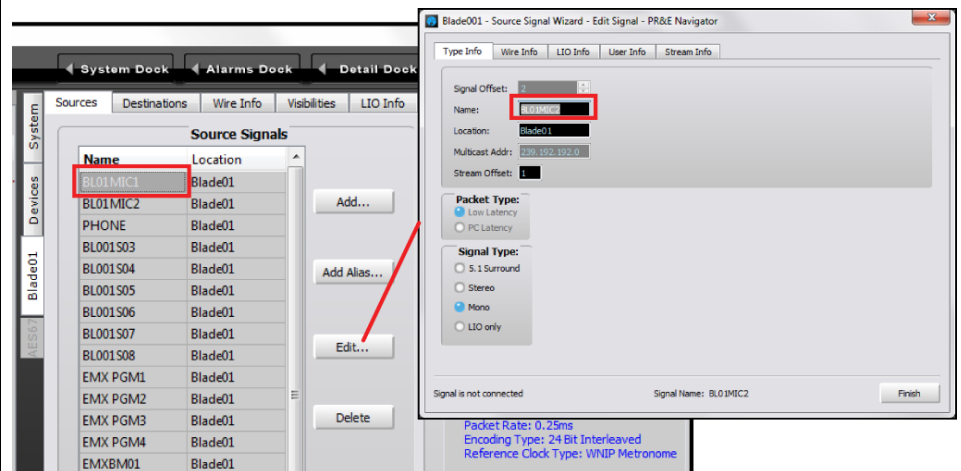
Figure 3-28 Editing a Signal

Creating Aliases

A source or destination may need to have a different name displayed, depending upon where or how the signal is being used, which might differ from the one assigned in Navigator. To accomplish this, an *Alias* can be created for any signal. An Alias is often used with mics to allow them to be named as: MIC 1, MIC 2, MIC 3, and so on in Navigator, but each mic can have multiple Aliases created named by "Talent names" so they appear in

the channel displays instead of the generic names (MIC 1, MIC 2, and so on) as set in Navigator.

To create an Alias, click on a Source name (you can also set up an Alias on a Destination or on a logic signal, but most often an Alias is created for a Source) then click *Add Alias…*. As an example, to create an Alias for BL01MIC1, click on that name (highlighted in Figure 3-28 on the last page) then click *Add Alias…* to open the *Add Alias* window. Type in the "Talent's name" in the *Name:* entry box. Click *Finish* to close the *Add Alias* window. The Alias name is now added as a completely new "source" that can then be added to channel source visibility lists.

When adding alias names and editing source and destination names, use the DMX Surface Setup app to run a new **System Scan** (shown on page 21). This action updates the Surface Setup app with the changes you made in Navigator, updating the signal names and adding the new Alias names to the Source and Destination lists so you can then add them to the Visibility lists.

Even though an Alias is created using a specific source or destination, each Alias is treated as a brand-new signal. This means that a mic signal Aliases will need the same VDips tab settings (see page 25) assigned to it as its source, like CR, Studio, and Cue mutes, and studio tally.

Level & Balance Controls

The **Meters** section of the **Sources** and the **Destinations** tab (Figure 3-29) shows the levels for the stereo and mono inputs, or the stereo and mono outputs, on the selected Blade (note that a Mix Engine only has stereo outputs).

Below each meter are level (**LVL**) controls for mono inputs and outputs. On stereo inputs and outputs there is a level and a round balance (**BAL**) control. These controls are prior to the meter displays so changing the level or balance is reflected in the meter display, when audio is present on that input or output. Since the level control affects the audio in real time, use caution on live systems when adjusting levels.

Levels are adjusted using any of these methods:

- Click/drag the level control up (for gain) or down (for trim)
- Click above/below the level control to add/subtract .5 dB per click
- Click/hold on the BAL control and drag around the control to pan the signal left/right
- Directly enter the amount of gain/trim or balance by highlighting the level or balance entry number then type in a new number. For levels, numbers from -18.0 up to +18.0 are valid. For balance, numbers from -100 (full left) to +100 (full right) are valid. Press *Enter* to assign the new gain or balance entry
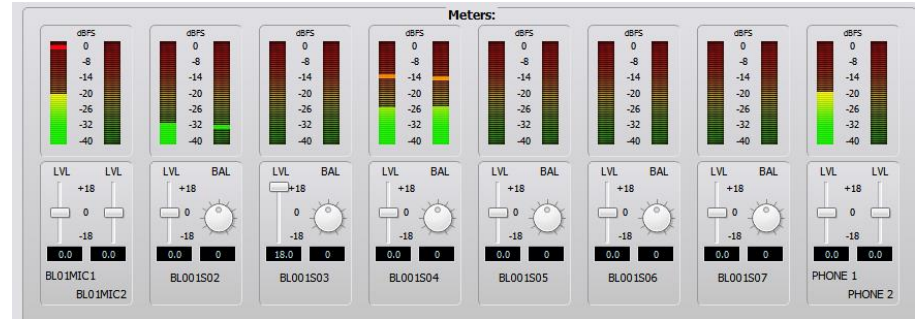

Figure 3-29 Meters: Section of the Sources and Destination tabs

Note: The top of the average signal bar graph should be around the -20 mark with the peak LED around the -8 mark (to allow for headroom). On Razor I/O Interfaces, the meters only show average level bar graphs.

The DMX Surface meters have better resolution than the on-screen meters so they should be used for the most accurate input level adjustment. Connect a test tone, at +4 dBu, from a connected device. Adjust the input control so the top of the bar graph is at -20 dBFS on the on-screen meters. Assign that signal to a DMX channel. Set the channel fader to align with the -12 dB unity gain arrows. Turn the channel on and assign it to a Program bus (with no other channels assigned to that bus). The DMX Surface meter's bar graph should light up all the green LEDs and one yellow LED, which is the -20 dBFS point on the DMX Surface meters. If this is not the case, adjust the input level or balance control.

Balanced vs. Unbalanced Inputs & Outputs

One common use for the input level control is to boost the gain of signals coming from an unbalanced device. Many "Prosumer" devices use ¼" connectors, but most are unbalanced TS (Tip-Sleeve) instead of balanced TRS (Tip-Ring-Sleeve) jacks. Their nominal output level is often the same as that found on consumer unbalanced "RCA" jacks: 300 mV instead of the 1.2 V nominal levels found on balanced devices.

The unbalanced device's hot signal is connected to the + input and, on a TS connector, the – input will end up being connected to ground. This will cause the input signal to be 6 dB lower, since it's unbalanced, but it often has a lower output level to begin with, so typically the level control must be used to add from +12 dB to +18 dB of gain to compensate for the lower level from the unbalanced device. Doing this eliminates needing a level match box on that unbalanced signal.

Note: A Blade's balanced output cannot directly connect to an unbalanced device—even though the output gain can be lowered to an appropriate output level, because there is no ground reference on the Blade's RJ45 output jacks. Thus, to properly connect the Blade to an unbalanced device requires that a balanced-to-

unbalanced match box or a balanced-to-unbalanced transformer be used to connect any Blade's analog output to an unbalanced device.

Assigning Logic

Blades have six LIO (Logic Inputs or Outputs) on each RJ45 Logic jack (there's one jack on the Mix Engine and Razor Interfaces, but two on WheatNet Blades). These LIO connections are used to connect legacy devices using hardware GPIO (General Purpose Input/Output) logic like a Henry Superelay, a CD player, hot mic arm LEDs, mic cough panel, etc.

In addition to the six GPIO "pins" on each RJ45 Logic jack, every Blade also has 128 "Software" or SLIO signals which are used to carry logic between the DMX and networked WNIP-compatible devices like Wheatstone talent panels, Eventide BD600W+ delay units, and automation software from RCS, Wide Orbit, ENCO, and many other vendors.

LIO and SLIO logic is set using the same **Edit Signal** window as used to set the audio format (stereo/mono) and to name the audio signals.

When the logic is associated with an audio input signal, like BLO1MIC1, select that audio input name (it highlights) then click *Edit* to open the Edit Signal window (the process shown in Figure 3-28 on page 40). Click the **LIO Info** tab (Figure 3-30) to view, edit, or delete the logic settings associated with that audio signal.

Figure 3-30 shows the typical settings used with a WNIP Talent Station (TS). It uses two logic signals to carry Remote On and Remote Off commands from the TS to the DMX channel, and two logic return signals to carry the On and Off Tally logic back to the TS. These are assigned using Software LIO since the TS is a networked device. Clicking *Add* opens the **Assign LIO** window which is also shown in Figure 3-30.

⚠️ **Note:** WNIP 6-channel GPIO Relay Interfaces are available from www.NotaBotYet.com. Each connects to an RJ45 Logic jack using a standard straight-thru CAT5 cable. These interfaces have screw terminals to connect the peripheral device wiring.

Logic-Only Signals

A logic-only signal can be created as either a source (select the **Blade > Sources tab**) or as a destination (select the **Blade > Destinations tab**). As an example of creating a new logic-only signal, here's how to setup a LIO Only destination to connect to a Control Room Warning Light.

On the **Blade > Destinations tab** click *Add…* to open a new *Add Signal* window. In the **Signal Type:** section, select *LIO only*. A default name is assigned to the new signal, like BL01D01. Edit that name to something useful, like CR WARN, by double-clicking on the name in the **Name:** entry box and entering a new name of up to eight characters. Click the *LIO Info* tab to open the **Logic Assignments** window, shown in Figure 3-30. On a new logic-only signal click *Add…* to open the **Assign an LIO** window, also

shown in Figure 3-30. The first open pin is highlighted which is Pin 2 in Figure 3-30. Clicking on another row allows that pin to be configured. To set the highlighted pin for output logic, like a Control Room warning command, select Output as the *Direction* then select the *Function* from the drop-down menu items. Our CR WARN command will use the Function: *Studio 1 In-Use* since Studio 1 is the Control Room. Click *Apply* to set that logic command then click *Close* to close that window. That command is then added to the list of logic commands in the LIO Info tab.
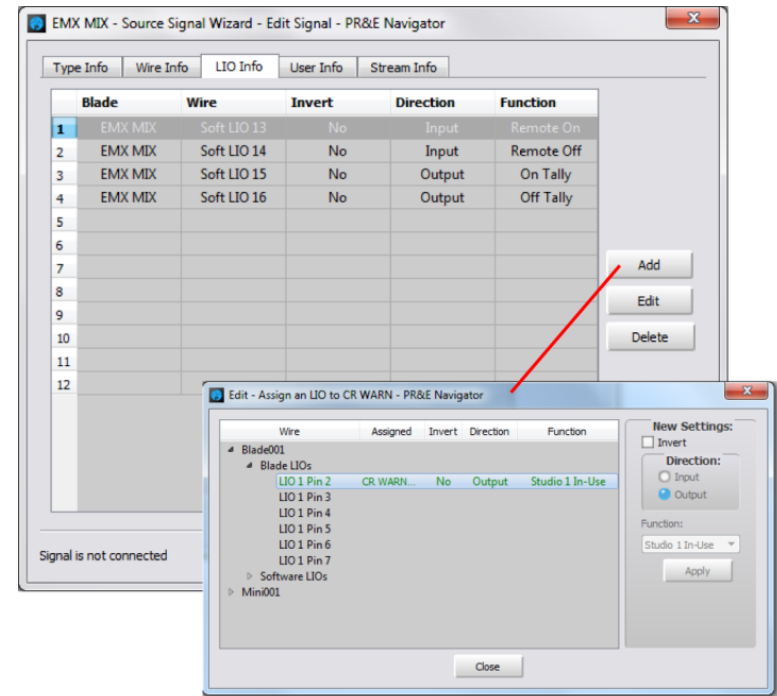
Figure 3-30 Logic Assignment tab

Switch to the Crosspoint map (**System > Crosspoint tab**) and locate the DMX console logic source: DMXTaly. That signal carries all the internal logic commands from the console so it must be cross connected to the new CR WARN destination by clicking (or CTLR+clicking) its crosspoint. A green square indicates it's a logic-only connection.

Now, when a CR mic channel is turned on, the Logic jack will have a contact closure between pin 2 (CR WARN) and pin 1 (ground). If a second LIO is assigned to pin 3, and labeled STU WARN and its Function is set as *Studio 2 In-Use*, when a Studio mic channel is turned on, there will be a contact closure between pin 3 (STU WARN) and pin 1 (ground). These logic outputs are then physically connected to hot studio warning interfaces; mic arm LEDs; a mic skimmer; etc.

Using the Soft Button

The large white Soft button can be set to manually trigger external logic and/or to light up in response from an external logic input, by adding a new LIO-only Destination, as outlined in the previous section with the Output Function: **Switch 1** and/or the Input Function: **Switch LED 1**. The logic destination is then connected to the source: **Spare01**, using the crosspoint grid, so it triggers the outgoing logic and/or lights up following the incoming logic.

The Soft button can also be assigned to make a momentary connection and/or fire a Salvo by assignment settings in the **Blade > LIO Info** tab (Figure 3-31). The Soft button is labeled as Spare Btn1 and is listed under Surface 1 Spares.

Pin Name	Input	Output	Function	Signal	Fire Salvo	Momentary Connection	Take Preset
▲ **Blade LIOs**							
LIO 1 Pin 2		●	Studio 1 In-Use	CR WARN	<none>	<none>	<none>
LIO 1 Pin 3		●	Studio 2 In-Use	STU WARN	<none>	<none>	<none>
LIO 1 Pin 4	○		User 1	USER 1	<none>	<none>	<none>
LIO 1 Pin 5	○		User 2	USER 1	<none>	<none>	<none>
LIO 1 Pin 6	○		<none>	<none>	<none>	<none>	<none>
LIO 1 Pin 7	○		<none>	<none>	<none>	<none>	<none>
▶ **Software LIOs**							
▶ **Functional LIOs**							
▲ **Surface 1 Spares**							
Spare Btn 1	●				<none>	<none>	none>

Figure 3-31 Blade > LIO Info tab

To use the Soft button as a momentary talk button, first set the Soft Button for the function *Momentary/Surface LED* (so its button lights up when pressed) in the DMX Surface Setup **Buttons page tab**.

In the **LIO Info** tab, double-click on <none> in the **Momentary Connection** column for *Spare Btn 1* to open the dialog box shown in Figure 3-32, left illustration. Click the checkbox to activate the Source and Destination signal selectors. In the example, the source is MIC1 (the board operator mic) and the destination is a call screener's output (CALLSCNR in this example). Clicking *OK* closes that dialog box and adds that entry to the Momentary Connection column for *Spare Btn 1*.

Now, while the Soft button is pressed, the board operator mic is switched into the call screener's speaker. When the Soft button is released the call screener's monitor audio is reconnected to their speakers.

To assign the Soft button to fire a Salvo double-click on <none> in the **Fire Salvo** column for Spare Btn 1. The Fire Salvo window opens (Figure 3-32, right illustration). Check the Fire Salvo checkbox to activate the *Salvo:* drop down list. Choose which Salvo to fire then click *OK* to close the window. That Salvo name then appears in the LIO Info tab.
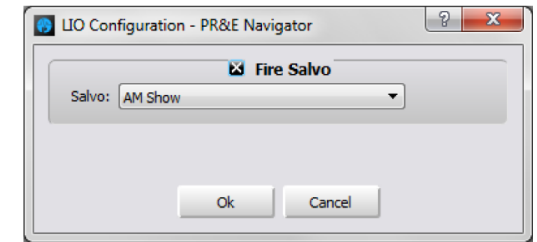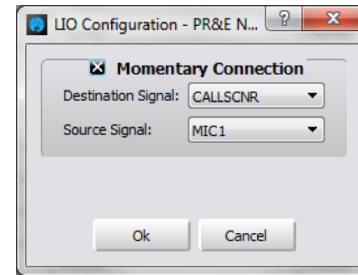
Figure 3-32 LIO Dialog Boxes

⚠️ **Note:** The Soft button can be set to perform any combination of firing a Salvo, making a Momentary Connection, and sending out an LIO and/or an SLIO command. This allows the Soft button to accomplish very complex actions at the press of the button.

Creating and Using Associated Connections

To create a new Associated Connection, click **System > Associate Connections** tab. If any Associated Connections have already been entered, they will already be listed in the tab, as shown in Figure 3-33.

Triggered Connections:

Destination	Source	Crosspoints
EMXIn12	PHONE 1	4

Associated Connections:

Upon connection between
Destination: EMXIn12
Source: PHONE 1

Destination	Source	Lock Override
PHONE 1	EMXBM12	Yes
TelRec A	MIC1	Yes
TelRec B	PHONE 1	Yes
VOXPRO	Telco MX	No
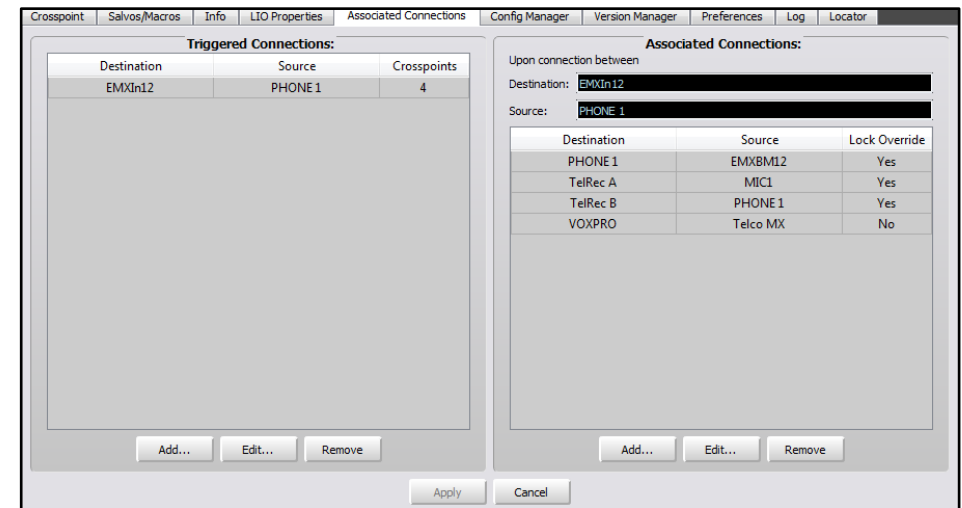
Figure 3-33 Associated Connections tab

To add a new Associated Connection, the **Triggered Connection** must first be defined in the left half of the tab. Click the *Add…* button to open the **Add Triggered Connection** window where the source-to-destination trigger connection is selected. In Figure 3-34, left illustration shows that the source is PHONE 1 and the destination is fader channel 12 (EMXIn12). Clicking *OK* in the dialog box adds that connection to the Triggered Connections list (as shown in Figure 3-33).

All the Associated Connections that should be made in response to that trigger connection are then defined on the right half of the tab. Highlight your new Triggered Connection then click the *Add...* button in the Associated Connections side of the window. This opens the **Add Associated Connection** window (Figure 3-34, right illustration) where a source-to-destination connection, which should be made when the triggered connection is detected, is assigned. Note that this window has an additional selection: *Lock Override*. When checked this causes the source-to-destination connection to be made even when the destination is locked. If Lock Override is left unchecked, the source-to-destination connection is not made if that destination is locked.
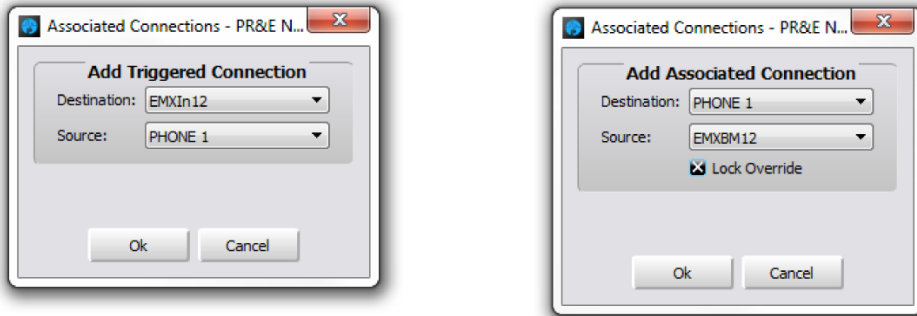

Figure 3-35 Creating Associated Connections for Sharing Talk Studio Mics

SOFTWARE UPDATES

Wheatstone may periodically issue software revisions for the DMX Surface, Mix Engine, and Razor I/O Interfaces. The DMX Surface code version is viewed and updated using the DMX Surface Setup app's Hardware menu (Figure 3-36). The Mix Engine and Razor code can be updated using Navigator's Version Manager tab (Figure 3-37 on the next page). Note that updating code requires that Navigator is licensed.

Figure 3-34 Associated Connection Dialog Boxes

Associated Connections are most often used to control the bus-minus connections for codecs which may be set as visible on multiple fader channels. For example, if Codec A is set as visible on channels 13 – 16 four Triggered Connections would be setup to monitor for Codec A being taken on any of those four channels. Each triggered connection would typically have one Associated Connection created to connect that channel's bus-minus to the Codec A output.

An example of a more complex Associated Connection is shown in Figure 3-35 which is used to switch four Talk Studio mics between a DMX console and an EMX console. When the Host mic is taken on channel 4 on the EMX console the Co-Host mic is automatically taken on channel 5, and the two Guest mics are taken on channels 6 and 7. The Studio warning logic is then connected to the EMX Tally.

When the same Host mic is taken on channel 1 on the DMX console, the Co-Host and Guest mics are connected to channels 2 – 4 on the DMX console and the DMX Tally is connected to the STU WARN logic output (which could be on the DMX, on the EMX, or on a Razor, or a Blade).

Surface Code Update

To see the current version of code running on the DMX Surface, in the DMX Surface Setup app select the *Hardware > Version…* menu item. A pop-up window lists information about the current code that's running on the DMX Surface, including the version number.
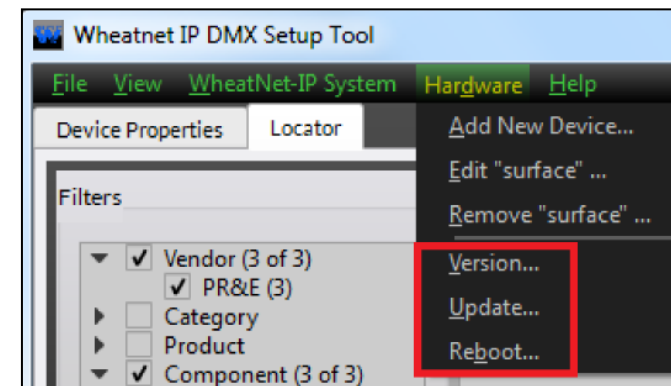
Figure 3-36 EMX Surface Code Version and Update options

DMX Surface code is downloaded to the PC as part of the DMX Surface Setup app installation so if you get an updated version of the Surface Setup app it may also have new Surface code. Updated versions of the Surface code may also be made available to be downloaded separately. Click *Hardware > Update…* to open a Windows file search window. It opens

on the folder where the code downloaded with the Surface Setup app gets saved. If the code was downloaded separately, then navigate to that folder. The code file will be named: **DMX_surface_X_X_X.rbn** with the Xs being the version number of the new code.

Click *Open* to upload the new code to the Surface. This action can be done while the console is actively being used since the code is only be uploaded into the Surface's static memory. A popup message advises that the Surface must be rebooted to use the new code.

Although the DMX continues to pass audio as the Surface is rebooted, the Surface controls will not be available during the 60 seconds or so it takes the Surface to complete rebooting and again be ready for use.

⚠️ **Note:** The PGM bus levels and the monitor outputs may momentarily duck or change levels as the Surface regains control after being rebooted.

Engine & Razor Code Update

The Mix Engine and Razor code is saved to the PC when the Navigator app is installed. If Navigator is updated, then there may also be an updated version of Blade code available as well. Updated operating system code for the Blades may also be made available to be downloaded separately from the Navigator app.

The code version running on each Blade can be viewed, and the code updated, using the *Version Manager* tab in Navigator (Figure 3-37). The Software Version column lists the code build currently running on each Blade which includes the Mix Engine and each Razor Interface. Blades can be individually updated by checking just one or two Blades, or they can all be updated simultaneously by clicking *Select All*.
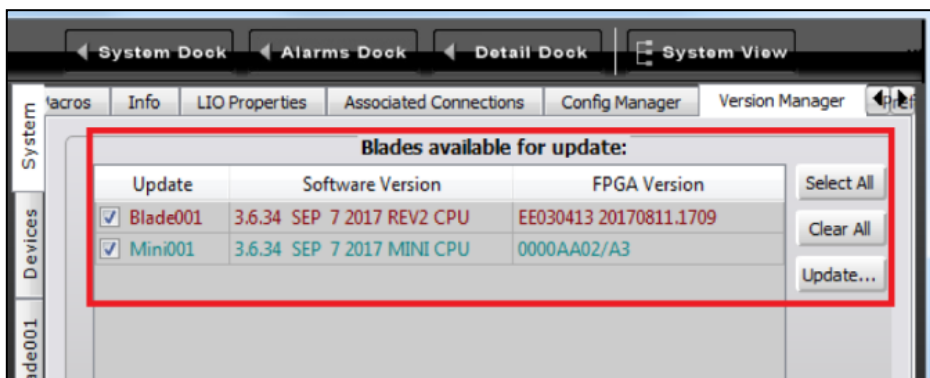
Figure 3-37 Mix Engine and Razor Code Version and Update options

To update the Blades which are checked, click the *Update...* to open a Windows file search window. It opens on the folder Navigator used to save the code installed with it. If the code file was downloaded separately, then the code file may be in a "Downloads" folder so use the file search window to locate the new code file. The Mix Engine and Razor code is in a compressed file named: **Blade_update_ X_X_XX.tgz**, with the Xs being the code version number.

Once the code is uploaded to the Blade(s), each Blade must be rebooted to run the updated code. As the updated code is subsequently run there will be momentary muting or audio changes on signals connected thru those Blades so, if possible, the code update process should be done while the system is bypassed and not carrying on-air audio.

T his chapter covers DMX operations for the board operator. It includes an overview of the DMX Surface controls and their functions; how to use the DMX to accomplish specific tasks; how to use the Advanced Channel Features (some of which may be locked-out from board operator access); and how to use the Razor I/O Interface front panel control and display.

CONSOLE OPERATION

DMX operation is identical, regardless of which size DMX Surface is being used—only the number of fader channels (either eight or sixteen) differs between the DMX-8 and DMX-16. Figure 4-1 is an overview of a DMX-8 Surface listing its main component parts.

Figure 4-1 DMX Surface Overview

Fader channel controls are detailed in Figure 4-2. The monitor controls are detailed in Figure 4-4 on page 50. The first mention of each control in the text is in **Bold** text.

Meter Bridge Features

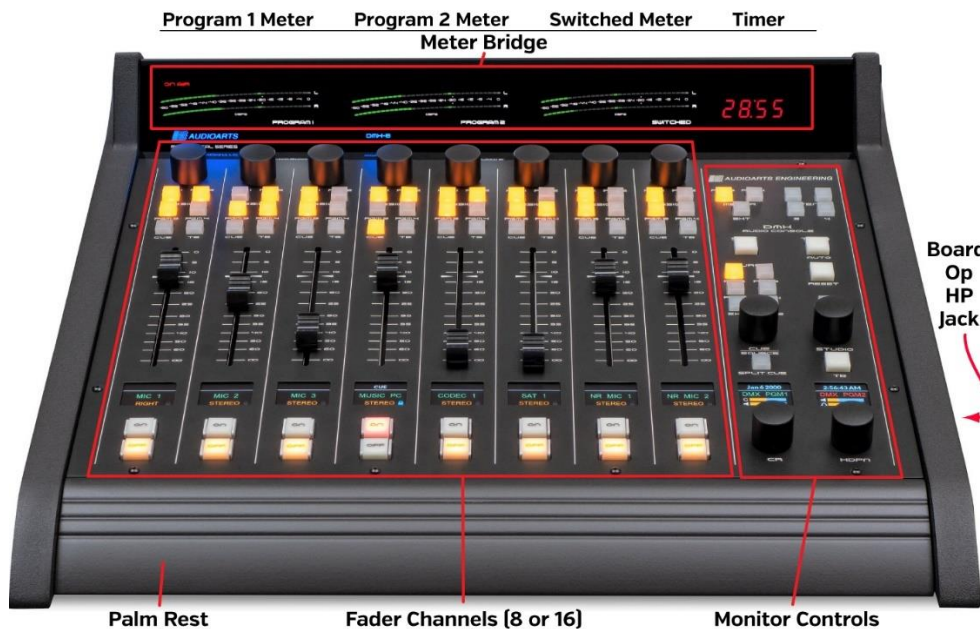There are three VU/Peak Program meters in the Meter Bridge. The left meter shows the Program 1 (PGM 1) bus level while the middle meter shows the Program 2 (PGM 2) bus level. The right meter is switched to show the Program 3 (**PGM 3**) or Program 4 (**PGM 4)** bus levels or an external source (**EXT**), selected by the **Switched Meter Source Select buttons** at the top of the left-hand column of monitor controls. The switched meter may also show cue levels (a DMX configuration setting).

Setting the source for the Switched Meter EXT button and Timer operation is covered in the *Monitor Control Operation* section (page 49).

Fader Channel Operation

Each fader channel normally has an audio source assigned to it. The source name is shown in green in the middle of the channel display. If a source has not been set for a channel, then **NoSource** is shown in the channel display.

Most fader channels have alternate sources, set during console configuration, to allow different sources to be "dialed up and taken." The alternate source names are listed in alphanumeric order when the **Channel Encoder** (the large knob at the top of each fader channel) is rotated while the channel is turned off. If the channel encoder is rotated while the channel is on, a **FADER ON** message appears in the display indicating you cannot change the source while the channel is on.

With the channel turned off, rotate a channel encoder. Notice that the channel display switches to show three source names with the currently selected source highlighted in the middle. Rotating the control Clockwise (CW) moves the highlighting down through the list of names. Turning it counterclockwise (CCW) moves the highlighting back up through the list of names. The list wraps around for a continuous display. If *NoSource* is set as visible on the channels (a configuration setting), it indicates the list has wrapped around since that's the first name in the list.
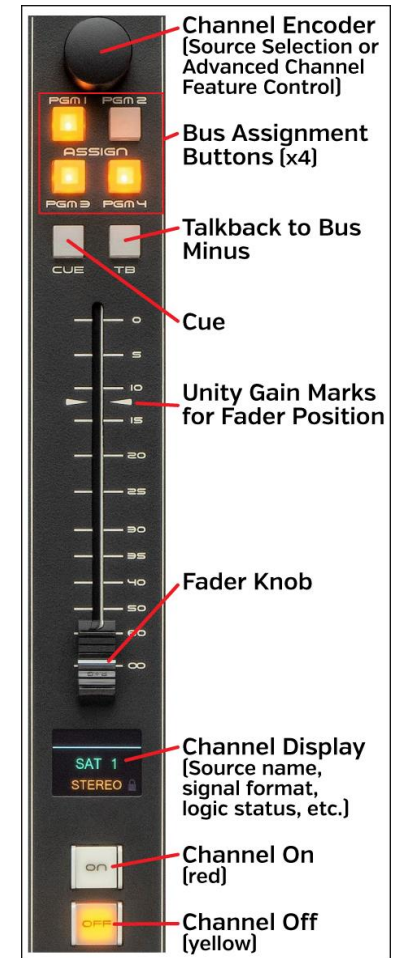

Figure 4-2 Fader Channel Controls

To select a new source, highlight its name then press down once or "click" the encoder knob. This "takes" the new source and its name then appears in green in the middle of the display.

⚠️ **Note:** Channel functions may change when a new source is selected since some channel settings are associated with the audio source rather than with the channel. One example is monitor muting when a channel is turned on. This occurs with a Control Room mic as the source but when a CD player is the source on that channel, when it's turned on the monitors are not muted.

Some channels will have dedicated sources, like the board operator mic, phone, and media server playback channels, so there may only be one or a few sources shown when the encoder is rotated. On channels with sources that are only used periodically (like a CD player or an auxiliary studio input) there may be a dozen or more sources available even though one source may always be "dialed up" on that channel.

Typically, one or more faders near the monitor controls will be setup so they will list every system source that might need to feed air, be recorded, be fed to a network, or be used to feed an Internet streamer.

Bus Assignment Buttons

Each fader channel can be assigned to any combination of the program buses using the **PGM 1**, **PGM 2**, **PGM 3**, and **PGM 4 Assign buttons**. A lit button indicates the channel is assigned to that bus. An unlit button indicates the channel is not assigned to that bus.

PGM 1 – **PGM 3** have identical operations in that all three buses are fed post-fader and post-Channel On switch. In other words, to hear the channel's audio on these three program buses the channel must first be assigned to that bus (**PGM 1**, **PGM 2**, and/or **PGM 3** buttons lit) then the channel must be turned on and the **Channel Fader** must be "potted up."

PGM 4 may differ from the other program buses because it can be set for pre-Channel On switch operation (the audio is always connected to that bus) and/or pre-fader operation (the fader does not affect that source's level to the PGM 4 bus). These settings allow the PGM 4 bus to function like a Send bus so that it could be used to feed an FX unit.

The PGM 4 bus buttons can also be set as Off Line bus assignment buttons. The Off Line or OL bus is used when phone callers and/or remotes are connected to the console. The PGM 4 bus assign buttons are then used to control which channels' audio is returned to the caller or remote while their channel is off. Using the special features of the PGM 4 / Off Line bus is covered in more detail in the next section (*Caller/Remote Operation*).

If no callers, remotes, or FX units are connected to the console, the PGM 4 bus would typically be set to function the same as the other three PGM buses: the channels feed it post-fader and post-Channel On switch.

For an on-air studio, PGM 1 is typically used to create the on-air signal. This means that all channels assigned to PGM 1, turned on, and potted up will feed air. PGM 2 is often used to create a network or Internet stream feed which requires alternate program elements from what's being broadcast over the air.

The PGM 2 and PGM 3 buses may also be used to simultaneously feed selected channels to recorders, whether to time-shift-record programming or to do voice-tracking while the console simultaneously feeds completely different source material to air.

In a production room, PGM 1 is typically connected to a PC running Adobe Audition or other on-screen editor. If the console is in a newsroom or a talk studio, the PGM 1 output might be included as a source on a fader channel on the air console to allow the board operator to mix in a news announcer going live from the newsroom while allowing the news announcer to control their own mix of playback actualities and other sounders along with their mic audio.

Caller/Remote Operation

When phone callers and/or live remotes are connected to the DMX, the PGM 4 buttons are typically configured as Off Line bus assignment buttons. The Off Line bus is then used to create the Bus Minus signal for each caller or remote while the caller or remote fader channel is turned off. This allows the board operator to carry on a hands-free conversation with the caller or remote using their mic. The caller/remote channels would be assigned to cue so the board operator can hear them in either the cue speaker and/or in their headphones.

The board operator's mic channel is assigned to PGM 4 (e.g., assigned to the Off Line bus). Typically, no other channel is assigned to PGM 4 so that the caller/remote only hears the board op's mic. If there's a host or producer, their mic may also be assigned to PGM 4 so the caller or remote can hear them as well.

If the caller/remote will go live to air, when their channel is turned on their return audio or Bus Minus signal switches from Off Line to the PGM 1 bus. Note that the bus sent to them when their channel is on is also a configuration setting so PGM 2, PGM 3, or PGM 4 could be sent to the caller/remote. This allows the caller/remote to hear everything, minus their own audio, feeding air so they can interact with guests in the studio and hear all the show's elements.

When the caller/remote channel is again turned off, their Bus Minus audio switches back to the Off Line bus so the board operator can give cues for a live remote or caller.

The audio going back to the caller/remote is often called an IFB (Interruptible Fold Back) signal since while the caller/remote listens to the fold back audio (e.g. their Bus Minus audio), the board operator can

interrupt that audio at any time by pressing the caller or remote channel's **TB** (Talkback) button in order to give them a cue.

Even though every channel has a TB button, it has no function—even though it does light while pressed, with channel sources like CD players since that channel's Bus Minus signal would not be connected to any destination.

When there's a lot of noise in the control room (like during a morning zoo format) "hand's free" call answering, where the board operator or Host mic channel is assigned to the Off Line bus, may not work—or you may not want a caller to hear everything that's going on in the studio! In this case, the board op mic channel would NOT be assigned to PGM 4 and in order to answer the phone or talk to a remote the board operator would need to press/hold the TB button on the caller/remote channel to talk to them.

When no channels are assigned to Off Line (no PGM 4 buttons are lit) then the caller/remote will not hear the control room unless the board operator presses and holds the caller/remote channel's TB (Talkback) button. Although this setup defeats hands-free operation, it ensures control room conversations are not heard by the caller or remote.

⚠ **Note:** Turning the cue speaker up too loud during a hands-free call can allow the caller's voice to be picked up by the host mic, which can cause echoes as their voice gets returned to them slightly delayed through the hybrid or codec.

There are two configuration settings which affect how a source is fed to the PGM 4/Off Line bus: each source can be independently set for Pre-Fader and/or Pre-On switch operation. Since there's no indication how these are assigned on the Surface, engineering will need to let board operators know how the PGM 4/Off Line bus is being fed since these settings affect both regular PGM 4 and Off Line operation.

When the DMX is just used with phone callers the Host Mic, and possibly a producer mic, is typically set to feed the Off Line bus pre-fader and pre-On switch, for ease of use. But this means that their mics are always heard by the callers—even when that channel is turned off and the fader is "potted down" if their PGM 4 button is lit.

If PGM4 Pre-Fader is not assigned, then the channel faders must be "potted up" for the caller/remote to hear channels assigned to the PGM 4/Off Line bus. If PGM4 Pre-On is not selected, then the channel must also be turned on before the Off Line bus will get audio. Note that this is a rarely used setting.

Cue

The **Cue** button controls whether a channel's pre-fader and pre-on switch audio is sent to the cue system, typically used to verify the correct audio is present on a satellite feed or a remote as well as for hands-free answering of phone callers. When a Cue button

is lit, that channel's source feeds the cue system. If it's not lit, then that channel's audio source does not feed the cue system.

The default connection is the cue bus goes to a **Cue monitor** output. The output level is controlled by the **Cue level control** in the left-hand column of monitor controls. Cue may also be auto switched into the board operator headphones. Cue can be fed in stereo (the **Split Cue button** is unlit) or in split mode (Split Cue button is lit) which puts cue in the left ear and leaves monitor audio in the right ear.

There are several other cue functions which are set during console configuration. Cue can be set to automatically turn off when a channel is turned on. It can also be automatically turned on when the fader is moved to full off. The cue audio levels may be shown in the switched meter while active. The Cue audio can also be set to feed the control room and/or the studio monitor outputs.

TB (Talkback)

Press/hold the channel TB button to momentarily talk into the Bus Minus audio for a caller or remote regardless of whether that channel is on or off. The TB button is typically used when the caller/remote is live (their channel is On) and the board operator needs to give them a cue since the board operator mic is normally assigned to PGM 4/Off Line and thus their voice will already be heard by the caller/remote while their channel is Off.

⚠ **Note:** While TB is pressed, the base mix audio (whether Off Line or a PGM bus) gets cut off to that caller or remote Also, in order for talkback to work the console's talkback destination (DMXTkBk) must be connected to a source in the **Navigator** Crosspoint Grid. Typically, the board operator's mic input is the talkback source.

Fader Control

The channel faders control the audio levels going to the assigned Program buses. The level range goes from full off (when the fader is full off and set to the ∞ symbol) to adding 12 dB of gain to the signal when the fader is at the 0 indication.

In an ideal world each fader knob would be set with their center line aligned with the two unity gain marks (the arrows next to the fader slot at the -12 position). When a channel is assigned to Cue and to PGM 1, and the fader is set to the unity gain marks if the switched meter is set to display cue, that meter and the PGM 1 meter levels will be identical.

Channel Control

To turn a channel on, press the **On button**. A red LED lights up the button to show the channel is on. To turn the channel
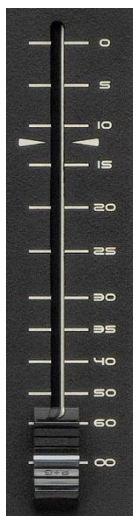
off, press the **Off button**. For most channel sources, a yellow LED lights up the Off button to indicate the channel is off. Some sources, like media server playback channels, have a logic command called Ready which allows it to control the Off-button's illumination to indicate play status. This function was originally used with cart decks to show their status: no Off button light indicated the cart was not ready; a solid Off light indicated the cart was cued and ready to play; and a winking Off button indicated a cart had already played. Some automation systems still use this convention to show playback channel status.

The channel faders may be set to automatically control the channel on and off as they are moved (called EFS or Electronic Fader Start). This means the channel turns on when the fader is moved up from full off (the ∞ symbol) and turns off when the fader is moved down to full off.

> ⚠️ **Note:** The channel on and off switches still function normally even when EFS is active.

Channel Display

Each channel has a color display to show channel status. Its normal display shows the source that's connected to that channel in green letters in the middle of the display, like BL01MIC1 shown in the left display in Figure 4-3. If no source is connected to the channel, then **NoSource** would be shown in green.

The display is divided by a white line with the area above the line listing whether channel equalization is active (**EQ**), whether Dynamics are in use (**DYN**), and whether Cue is active (**CUE**). When a new source is being selected by using the channel encoder the Device Name that has the highlighted source appears above the line. In the right display in Figure 4-3 the highlighted source (BL001S02) is on Blade01, which is the default name for a DMX Mix Engine.

In the normal display, the channel's mode setting is shown in orange below the channel source name. The default setting for every channel is Stereo (a mono signal like a mic or a phone caller is automatically fed to both the left and right channels) but alternate settings: Left, Right, or Mono may also be shown.

To either side of the Mode name are icons to indicate channel status. On the right side is a lock indicator to indicate the channel source's logic control state. When the lock icon is Gray it indicates that signal has no logic control by any channel. When it's Blue, as shown in Figure 4-3, it indicates that channel fader has logic control for that source. When the icon is an opened Red lock it indicates that source is active on another channel fader—regardless of whether on this Surface or on another console, and thus this fader channel does not have logic control.

To the left of the Mode is a mic icon when the channel's source is a Control Room, a Studio, or an external mic. The icon turns red while the channel is on.

Rotating the Channel Encoder, while the channel is off, changes the normal display to show a list of the alternate source names available on that channel (Figure 4-3, right display). The current source is initially shown highlighted in the middle. Rotating the encoder clockwise moves the highlighting down the list and rotating it counterclockwise moves the highlighting up through the list.

Source names are typically shown in alphanumeric order, but the names may also be ordered by their location (a console configuration setting). This alternate setting means that when the encoder is first rotated, a list of networked devices (Blade01, Blade02, Blade03, and so on) is shown. In this case, highlight a device then click the encoder to select that device. The displayed list then shows the source names on that device in alphanumeric order. Clicking the encoder selects the highlighted name and returns the display to the normal display where the selected source name is shown in green.

Monitor Control Operation

The monitor controls on the DMX Surface are identified in Figure 4-4 on the next page. The controls are arranged in two columns: the left column has the switched meter source selectors and control room monitoring controls; the right column has studio monitor controls along with the Event and Timer controls.

Left Column Controls

At the top of this column are **three Switched Meter Source** select buttons (PGM 3, PGM 4, and EXT). The lit button indicates which source is feeding the switched meter. A source is typically assigned to the **EXT** (External) button during DMX configuration, but it can also be assigned by the board operator by press/holding the EXT button until the button begins blinking (about four seconds). The left-hand monitor OLED display switches to show a list of sources that can be assigned to the EXT button. Rotate the **Cue/Source Encoder** to highlight the desired source name in the display. Tap or "click" the Cue/Source encoder to assign the highlighted source to the EXT button. Note that the EXT button selection is also saved as part of a console Event so the EXT source could change depending upon which Event is active.
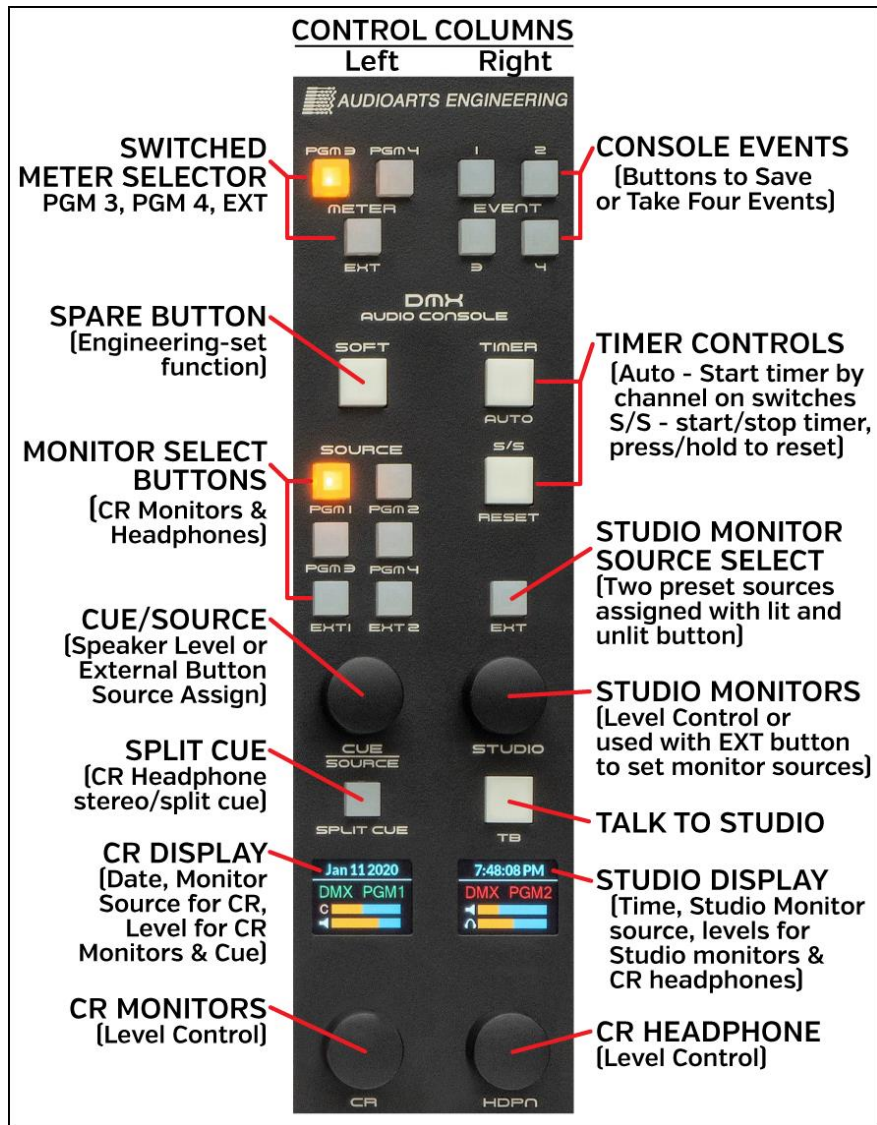
Figure 4-4 Fader Channel Controls

Below the three switched meter buttons is a large white **Soft button**. This button is user-defined, so engineering will have to identify if that button is active. Here are a few examples of what the Soft button might be used for: to switch the console between standard and automated operation, as a dump button with a safe indication for a profanity delay, as a talkback button to talk to an external location like a producer, call screener, or a news room, as a ring indicator for the hotline phone, or as a studio door lock/unlock control.

The six **Monitor Source Selector buttons** (PGM 1, PGM 2, PGM 3, PGM 4, EXT 1, EXT 2) set which signal feeds the Control Room monitor speakers and the Control Room headphone jack. The current source is shown in green in the middle of the left **CR Display**.

⚠️ **Note:** A "wild" or temporary source can be feed to the CR monitors by press/holding the Cue/Source encoder, for about three seconds, until a list of names appears in the left monitor display. Rotate the Cue/Source encoder to choose a source by highlighting the name. Click the Cue/Source encoder to select that source. Its name then appears in red, indicating it's a wild (i.e. temporary) source. A red name can also mean that Navigator was used to connect a source to the CR monitor, or that the wild monitor source was saved as part of an Event or as part of a Salvo.

Cue

The Cue/Source encoder normally controls the level for an outboard amplified cue speaker connected to the Cue Monitor Output on the Mix Engine. Adjusting it also affects the Cue bar graph, the top blue/orange bar graph in the left monitor display with the C icon.

⚠️ **Note:** The cue speaker(s) should be set to mute whenever a control room mic channel is on.

The Cue/Source encoder is also used to select the source assigned to the Switched Meter EXT button and to the EXT 1 and EXT 2 Monitor Select buttons. To assign a source, press/hold the EXT, the EXT 1, or the EXT 2 button for about four seconds—until its LED begins blinking and a list of source names appear in the left monitor display. Rotate the Cue/Source encoder to step through the visible source names. When the desired source is highlighted, click the Cue/Source encoder to assign that source to the blinking button. The blinking EXT button then turns off indicating that source is assigned.

Split Cue

The **Split Cue button**, when lit and cue is active, feeds cue audio to the left ear and the selected monitor source is summed into the right ear of the operator headphones. When Split Cue is unlit, and cue is active, cue is sent to both ears (stereo cue) which cuts off the monitor source audio.

⚠️ **Note:** Whether cue is auto switched into the board operator headphones is a console setup option, so cue might not affect the headphone audio.

Monitor Displays

The two OLED displays in the monitor section show the current date in the left display above the white line, and the current time above the white line in the right display. The name of the current CR monitor source is shown in the middle of the left display while the current Studio monitor source is the shown in the middle of the right display. A green name

indicates that source is assigned to a selection button. A red name indicates a "wild" monitor source, not assigned to any of the source select buttons, is the active source.

The four bar graphs at the bottom of the displays show the Cue and CR monitor speaker levels in the left display and the Studio monitor and CR headphone levels in the right display.

Figure 4-5 Monitor Displays

The Control Room monitor speakers and the cue speakers are typically muted, and an on-air warning light triggered, whenever a control room mic is turned on. Likewise, when a studio mic is turned on the Studio monitors mute. A red X is displayed over the bar graph icon to indicate that output is currently muted.

CR Monitor Speaker Level Control

The **CR Encoder** controls the level of the control room monitor speakers. Its relative level is shown in the lower blue/orange bar graph with the speaker icon in the left monitor display.

Right Monitor Column Controls

At the top of this column are the four powerful **Event buttons**. Each button can be used to save a console setup during console configuration so that it can be later 'taken" to change channel sources, channel bus assignments, turn Advanced Channel Feature settings on or off, change the EQ and Dynamics settings, change the CR and Studio monitor sources, and change the sources assigned to the various monitor section EXT buttons. Usually, after the Events are saved, the Event Save feature is locked by engineering so board operators can only take Events.

Even though taking an Event affects the entire DMX Surface and could change every fader channel setting and monitor control panel setting, most Events will typically only affect a few channels and may not change anything in the monitor section since the console may not need that much reconfiguration between shows or dayparts.

The daypart, show, or function (production, backup air, morning show, etc.) that's assigned to each Event button must be identified by the engineering department.

Here's an example of how the four Event buttons might be used:

EVENT 1 – Sets up the console for a multiple mic morning show with traffic and weather remotes

EVENT 2 – Sets up the console for a regular live remote show

EVENT 3 – Sets up the console for single mic board operation with one caller channel

EVENT 4 – Sets up part of the console for voice tracking while on-air

Taking an Event is a two-step process:

1. Arm the Event. To arm an Event, press/hold the Event button you want to take. Release the button when it begins blinking (after about three seconds). The blinking indicates that Event is now "armed." It can stay armed for an indefinite time so if you must switch events at a specific time you can arm it at any time prior.

2. Take the Event. At the proper time (like during the last commercial in a stop set before the new daypart starts), press and release the blinking Event button. It lights solid to indicate that Event is now active. All Surface settings get updated within a couple seconds.

Note: Any fader channels that are on when the Event is taken will not be affected by the new Event settings. They maintain their current settings. After those faders are turned off, rearm and retake the same Event (press/hold the lit Event button until it blinks, then let go, then press it again) to update those fader channels.

To save an Event, setup the console as required then press/hold an Event button for about five seconds. The button will begin blinking after about three seconds and will then light solid indicating the Event settings have been saved. This erases any previously saved Event on that button.

Note: If you press/hold an Event button and nothing happens that indicates that both the Take Event and Save Event functions are locked out. If the button begins blinking but never lights up solid, that indicates the Save Event function is locked out, but the Take Event function is active. To cancel taking an Event (an Event button is blinking) press another Event button.

Timer Controls

The meter bridge timer is controlled using two buttons: **Auto Reset** and the **S/S (Start/Stop) button**.

To manually start the timer, tap the S/S button. To stop the timer while it's running, tap the S/S button. The elapsed time is displayed. Tapping the S/S button again will start the timer from the elapsed time. To reset

the timer to 00:00 press/hold the S/S button. If running, the timer resets to 00:00 and begins counting. If stopped, the timer just resets to 00:00.

When **Auto Reset** is lit, the timer will be reset to 00:00 and will begin counting when a fader channel, whose source has the *Timer Restart* option set, is turned on. Which channel sources have the Timer Reset capability is set by engineering during console configuration.

Studio Controls

The **Studio Encoder** is normally used to control the level of the monitor speakers in a separate talk studio, news room, producer location, call screener, performance studio, or other external location—anywhere that a microphone, when connected to the console, would need monitor speaker muting when a studio mic is live. The Studio monitor speakers are automatically muted, and a studio warning light typically triggered, when a studio microphone is on.

The volume of the STU output on the Mix Engine is normally controlled by the Studio encoder, but if a studio-mounted level control is used the Surface's STUDIO encoder can be set inactive (a console configuration setting).

The studio monitor source can be toggled using the **Studio EXT** button. One source is selected when the EXT button is lit, a second monitor source is selected when the EXT button is unlit.

To set the unlit EXT button source, press/hold the unlit EXT button until it begins blinking (about three seconds). The right monitor display switches to show source names that can be assigned to the EXT button. Use the **Studio encoder** to highlight a source name then click the Studio encoder to assign it as the unlit EXT button source.

To set the lit EXT button source, press/hold the lit EXT button (for about three seconds) until it begins blinking. Use the Studio encoder to select the source as was done for the unlit EXT button.

An "on-the-fly" studio source can also be selected by press/holding the Studio encoder for about three seconds, until a list of visible source names appears in the right-hand monitor display. Highlight the desired source then click the Studio encoder to select that source. Its name is shown in red in the right monitor display (shown in Figure 4-4 on page 50) to indicate it's a temporary monitor source. The list of the source names available to be assigned to the EXT button or as an on-the-fly monitor source was set by engineering during console configuration.

The board operator can talk into the studio monitor speakers using the large **TB button** located between the Studio Monitor encoder and right monitor display. See the *TB (Talkback)* section on page 47 about setting the source for talkback audio.

Board Operator Headphone Level

The **HDPN encoder** controls the volume of the board operator's headphones. Its level is shown in the lower blue/orange bar graph with the headphone icon in the right monitor display.

⚠ **Note:** A 1/4" TRS headphone jack is located on the right side of the Surface, in-line with the monitor displays, for the board operator headphones. Consumer headphones with 1/8" TRS plugs require using an 1/8"-to-1/4" TRS adapter. Since the top of many of these adapters, when plugged in, are flush or below the side panel, they can be difficult to unplug. TRS adapters with longer shafts are available so that they extend past the side panel. Otherwise, require operators to use headphones with 1/4" TRS plugs or ones that incorporate screw-on TRS adapters so they can easily be unplugged from the 1/4" TRS jack.

USING THE ADVANCED CHANNEL FEATURES

Each fader channel has three Advanced Channel Features: Mode, Panning, and EQ & Dynamics, each of which can be disabled from board operator access in the DMX Surface Setup app's *Talent Access page tab* (Figure 4-6). In daily use, these controls are typically disabled (unchecked) for air consoles, but are usually enabled (checked) for production and other non-air consoles
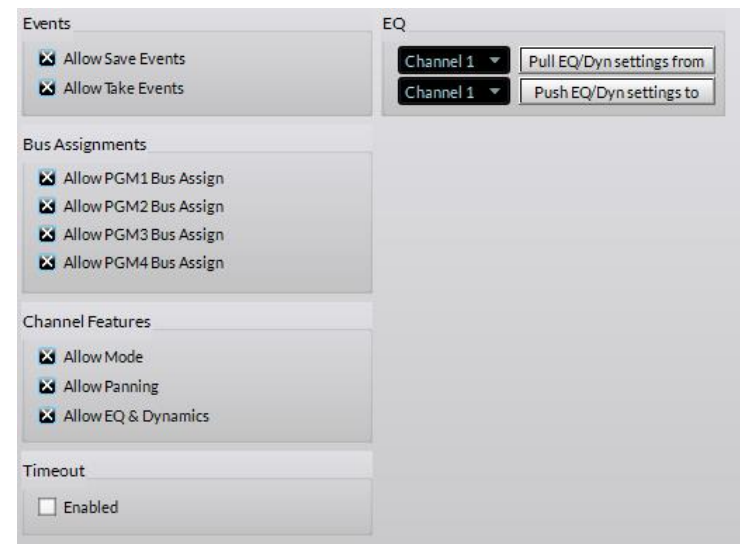

Figure 4-6 Talent Access Controls in Surface Setup App

When an Advanced Channel Feature is active on a channel, but the channel encoder is not touched for about 20 seconds, that channel's display (or displays when EQ & Dynamics is active) timeout, switching back to the normal view.

During console setup the auto-timeout feature can be disabled which simplifies setting up the EQ and Dynamics. To prevent the auto-timeout, uncheck the Enabled option in the *Timeout* section of the Talent Access page tab. Typically this option is checked before the console is released for daily operations.

Mode & Panning

When the Channel Feature *Allow Mode* is checked, double-clicking any channel encoder (tapping it twice quickly) changes that channel display. **MODE** is shown above the white line in the channel display. Rotating the encoder steps through the four audio modes: LEFT only, RIGHT only, MONO sum, and STEREO.

Double-clicking the encoder, while **Mode** is active, switches the display to show **PAN**, when *Allow Panning* is checked in the Talent Access page tab. Now rotating the channel encoder pans the signal from center toward full-left or toward full-right. If *Allow Mode* is not checked, double-clicking a channel encoder brings up **PAN** rather than **MODE**.

EQ & Dynamics

If *Allow Mode*, *Allow Panning*, and *Allow EQ & Dynamics* are checked, double-clicking the encoder while Pan is active changes eight channel displays to show the **EQ & Dynamics controls**. If *Allow EQ & Dynamics* is unchecked, double-clicking the encoder while Pan is active returns the display to the normal mode. If *Allow Mode* and *Allow Panning* are not checked, double-clicking a channel encoder immediately changes the displays to show the EQ & Dynamics controls. To exit the EQ & Dynamics controls, double-click the channel encoder again. The channel displays then return to their normal views.

The **EQ & Dynamics** Advanced Channel Feature takes over all eight channel displays on a DMX-8. On the DMX-16, when EQ & Dynamics is active on channel 1 to 8, the displays on channels 1 - 8 show the EQ & Dynamics screens. When active on channel 9 to 16, the EQ & Dynamics screens are shown on the channels 9 – 16 displays. The six screens that show EQ and Dynamics status are shown in Figure 4-7.

Figure 4-7 EQ & Dynamics In/Out Selection Screens

The two other EQ & Dynamics screens—on channels 7 and 8 or on channels 15 and 16, show a graphic of how the EQ or Dynamics settings affect the audio (in the channel 7 or 15 display) and display a list of the various EQ and Dynamics control screens in the channel 8 or 16 display.

The active channel number is listed above the white line (Figure 4-8). Rotate the channel 8 (or 16) encoder to step through the list of control screens which also changes what's shown in the other seven EQ & Dynamics screens.

The channel display for the active channel is also outlined in white to further identify which channel's EQ and Dynamics is being affected. In Figure 4-8, channel 7 is active, thus the **Input 7** is shown above the white line on channel 8 and the graphic display on channel 7 is outlined in white.
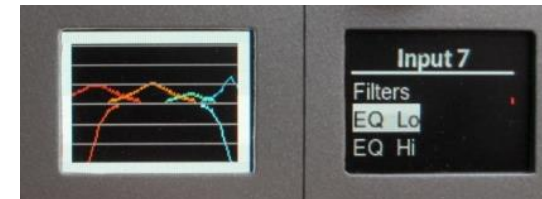

Figure 4-8 Active Channel Indications

Saving & Recalling EQ & Dynamics Settings

EQ & Dynamics are assigned on a channel basis. The settings for each channel are saved in the Surface's memory so the settings are restored if the Surface gets rebooted or power cycled.

When a channel has any of the five types of EQ (the settings shown in Figure 4-7, screens 1 - 5) set as In, instead of Out, **EQ** is shown above the white line in that channel's normal display to indicate that equalization is active. When Dynamics (Compression and/or Expansion) is set In, **DYN** is shown above the white line in that channel's normal display to show that Dynamics control is active.

⚠️ **Note:** As shipped from the factory, fader channels 1 and 2—typically used for the Host and Guest mics, have microphone EQ and Dynamics applied to them, which is why **EQ** and **DYN** are displayed on those two channels by default.

The EQ & Dynamics settings applied to any channel can be "pulled" from the channel and saved to an "EQ config file." A previously saved EQ config file can then be "pushed" or loaded into another channel. Both the "Push" and "Pull" functions are done using the DMX Surface Setup app's EQ Section on the *Talent Access page tab* (Figure 4-9 on the next page).

To pull the EQ and Dynamics settings from a channel, use the upper row of the EQ section controls to select the channel using the drop-down list then click the *Pull EQ/Dyn settings from* button. A File Save dialog box opens to name the file (like "hybrid" shown in Figure 4-9). Click Save to save the file with a .dmx_eq suffix which identifies it as an EQ config file.

To recall a previously saved EQ config file, select which channel you want to apply the settings to, using the lower EQ row drop-down list, then

click the *Push EQ/Dyn settings to* button. A file find dialog box opens so a saved EQ Config file can be selected to apply to that channel.

⚠️ **Note:** The EQ and Dynamics settings assigned to faders 1 and 2 from the factory are saved in the EQ file: WNIP_mic.dmx_eq.
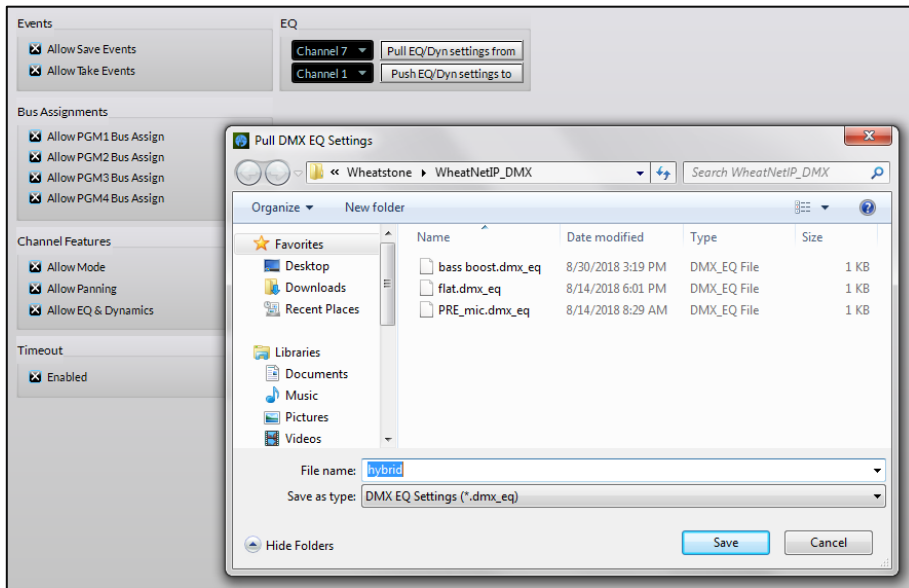

Figure 4-9 Saving & Recalling EQ Configuration Files

EQ & Dynamics Screens

When any of the EQ controls are active, the next to last EQ & Dynamics channel display (channel 7 or 15) has an audio frequency graph (Figure 4-10, left and middle illustrations) which shows the current settings of the various EQ controls. The EQ graphic shows frequency response from 20 Hz (left side) to 20 kHz (right side). The center of the display is roughly 600 Hz since it uses a logarithmic scale. The middle horizontal line represents 0 dB of gain and each white horizontal line above or below it represents about 5 dB of level.

Even though the EQ & Dynamics settings are made on a channel-basis, rather than applied to a particular source, because these settings are saved as part of the four console **Events** (along with the channel sources and other channel and monitor settings), with careful planning one can apply different EQ & Dynamics, Mode, and Panning to specific audio sources by using Events.

⚠️ **Note:** Taking an Event overrides whatever EQ & Dynamics settings—and mode and pan settings are currently assigned on each channel.
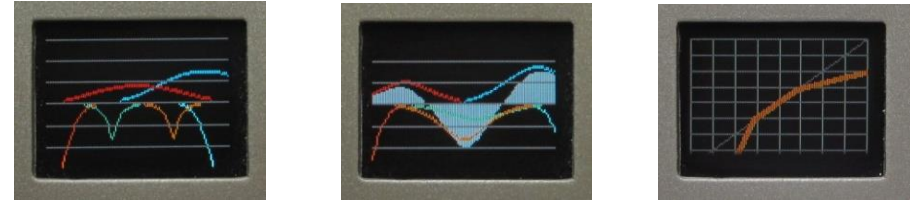

Figure 4-10 EQ Out, EQ In, and Dynamics Graphic Screens

The four parametric EQ controls are color-coded. The filter controls and graphic settings for the HPF and Low EQ settings are in red; the Low-Mid EQ is orange; the High-Mid EQ is green; and the LPF and High EQ settings are blue.

When the EQ is not active (all are set Out) lines are shown across the display, as shown in the left screen in Figure 4-10. When the EQ is active (set In) then the audio pass band is represented in gray, as shown in the middle screen in Figure 4-10.

When the Compression or Expansion control screens are active the Dynamics display is shown (right screen in Figure 4-10). It's a very different type of display since it graphically shows the ratio between the incoming audio and the dynamically processed output audio. When Dynamics is set Out the response line is gray. When Dynamics is set In the line is orange. The top half of the display reflects the Compressor's settings while the bottom half reflects the Expander's settings.

High Pass & Low Pass Filters

The High Pass Filter (HPF) and Low Pass Filter (LPF) can be used independently on any channel (each can be set In or Out) to narrow the audio frequency range of that channel's audio to less than 20 Hz – 20 kHz. The frequency pass band is shown graphically as the controls are adjusted: a red line represents the HPF or low frequency cutoff while a blue line represents the LPF or high frequency cutoff.
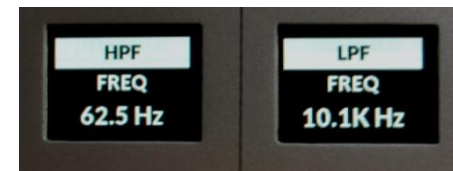
Figure 4-11 High and Low Pass Filter Screens

Adjusting the channel encoder on the channel with the HPF display (Figure 4-11) adjusts the frequency where the lower sounds begin to be rolled off or attenuated. The control range is 16 Hz to 500 Hz. Audio below the selected frequency gets rolled off at 24 dB per octave. Audio above the selected frequency is not affected. The HPF is commonly used to remove low frequency rumble and sounds emitted by air conditioners, AC line

hum, nearby traffic, footsteps, cabinet noises being picked up by the mic arms, etc.

Adjusting the channel encoder on the channel with the LPF display adjusts where the higher frequency or brighter sounds are attenuated. The control range is 20 kHz down to 1 kHz. This control can selectively remove higher frequency sounds like hiss from an air conditioner, chair squeaks, and other high frequency noises without affecting the voice sound—unless the control is adjusted below about 5 kHz. Audio above the selected frequency gets rolled off at 24 dB per octave while audio below that frequency is not affected.

The HPF and LPF can also be used together to create the classic phone filter effect on a voice. To do this, adjust the HPF to about 300 Hz and the LPF to about 3 kHz. If this setting is saved as an EQ file, it can be loaded into any channel using the DMX Surface Setup app's EQ controls.

Four-Band Parametric Equalization

The four parametric EQs (EQ Lo, EQ Lo Mid, EQ Hi Mid, and EQ Hi) are all identical in operation and actually have the same set of parameters and control ranges.

The three EQ Lo screens are shown in Figure 4-12. Note their red color which matches the color shown in the EQ Graphic screen. Each parametric EQ has a FREQ (frequency) control to adjust the center-point of that EQ; a BW (bandwidth) control to adjust the width of frequencies being affected by that EQ; and a LEVEL control to set the amount of boost or cut applied to that equalizer.

These controls are active when EQ is set In and the two Shelf EQs are set Out. The channel 8 or 16 encoder is used to select between showing EQ Lo (which shows EQ Lo and EQ Lo Mid controls) and EQ Hi (which shows the EQ Hi Mid and the EQ Hi controls).

Figure 4-12 Parametric EQ Lo and Lo Mid Screens

Each parametric EQ's center frequency is adjustable from 16.1 Hz up to 20.2 kHz. The bandwidth that each EQ affects is adjustable from 0.20 octaves wide up to 3.00 octaves wide. Each equalizer can boost or cut the selected frequency band +14 or -14 dB from unity gain in 0.1 dB steps.

Typically, the parametric equalization is adjusted prior to adding any compression or expansion since the EQ settings and the compression and expansion settings interact with one another's operation.

EQ Lo Shelf & EQ Hi Shelf

These two filters are only active when EQ is set In along with either or both Shelf's being set In. When active, the screens for the EQ Lo and/or EQ Hi are affected. While the Shelf is active it assigns a fixed bandwidth so the BW (Bandwidth) screen is not shown. The FREQ and LEVEL controls operate the same as for the regular parametric equalizer.

The two Lo Shelf controls are used to boost or cut the low frequencies below the selected frequency by the amount set by the level control.

The two Hi Shelf controls are used to boost or cut the high frequencies above the selected frequency by the amount set by the level control.

The channel encoder with the EQ Shelf LEVEL screen sets the amount of boost (up to +14 dB) or cut (up to -14 dB) that's applied. The channel encoder with the EQ Shelf FREQ screen sets where that shelf ends or begins. The Lo Shelf FREQ control adjusts where the low shelf ends, from 20.3 Hz up to 198 Hz. The Hi Shelf FREQ control adjusts where the high shelf starts, which can be from 4 kHz up to 20.2 kHz.

Dynamics – Compression and Expansion

When **Dynamics** is set In the Compressor and Expander functions are activated. The Compressor has five controls, with an orange background, which affect the overall dynamic range of the audio signal by controlling the loudest audio levels. The six Expander controls (teal background), work at the opposite end of the dynamic range, controlling what happens with very low-level audio signals.

Figure 4-13 Compressor Screens

Compression

A Compressor controls the overall loudness of an audio signal. A small amount of compression is often applied to mics and phone callers to "even out" their overall audio levels. Applying higher levels of compression, along with using a higher threshold, allows one to obtain consistent maximum loudness for "shock jocks" and "in-your-face" commentators.

The compressor in the DMX is a soft knee compressor which means its operation is less noticeable—for most settings. Setting the controls to their extreme settings, to get that "loud and in your face" sound that's right on the edge of audio distortion, can cause audible compression artifacts.

To adjust the Compressor (Figure 4-13 shows the compressor screens), set the Compressor RATIO to 1.0:1 (no compression) and the Compressor MAKEUP level to 0.0 dB (no added gain). The Threshold (THRESH) point sets where the compressor begins to act upon the audio (which can be from -40 dB up to +10 dB). A good place to start is 0 dB.

As the audio level goes past the Threshold point the compressor begins controlling the ratio of the outgoing audio compared to the incoming audio. A RATIO of 1.0:1 (no compression) means the output level tracks the input level. As the RATIO control is adjusted from 1.0:1 up to the 6.0:1 range you increase the amount of level control over the compressor's output. With a 2.0:1 setting, when the input rises 10 dB over the threshold level, the compressor's output only increases by 5 dB. With a 6.0:1 ration a 10 dB increase in the input audio (past threshold) means the audio output is only increased by 1.7 dB.

Setting a higher RATIO, like 10:1 up to 20:1, sets the compressor to function as a limiter. Typically, with high RATIO settings you'll set the THRESH higher since you only want to "squash" the very hottest input signals so you can maintain the compressor's output to be as loud as possible without overdriving and causing distortion further on in the signal chain. If needed, the MAKEUP gain can be adjusted to compensate for highly compressed output levels.

The ATTACK control sets how fast the compressor reacts (from 0.10 mS up to 330 mS) as the audio raises above the THRESH level. Usually you want to use the fastest setting possible, but it really depends upon the audio program since faster settings will be more audible. Using very slow settings can allow the audio to go way past the threshold point before the compressor kicks in, either allowing distortion or causing audio "pumping" when the compressor kicks in and noticeable lowers the output level.

The RELEASE control sets how fast the compressor "un-compresses" the audio signal after the audio drops below the THRESH level. It can be set from 50 mS up to 3.00 seconds. Again, using settings in the middle of the ranges allows for the most transparent compression. Using extremely fast settings will result in audio "pumping" as the compressor is opened and closed in response to quick audio changes. Again, the type of audio program being compressed, whether voice, music, phone caller, remote, etc., must be taken into account when setting the Release.

Expander

The Expander screens are shown in Figure 4-14. The Expander is an automatic attenuator controlled by settings of the RATIO and DEPTH controls. These allow one to slightly duck or dim the audio to virtually muting (gating) the input audio once its level falls below the THRESH (threshold) setting. The Expander is often used to automatically mute inactive mics in a talk studio by gating their audio or decrease background noise on phone calls or remotes by ducking the audio as it falls below the THRESH setting.

Figure 4-14 Expander Screens

How quickly this ducking/gating occurs and releases, and thus how noticeable it is, is set by the OPEN (1.00 mS up to 100 mS), HANG (0.00 mS up to 1.00 S), and CLOSE (50 ms up to 3.00 S) settings. HANG sets how long the expander waits, as the audio level passes the THRESH setting, before either opening or closing. CLOSE sets how fast the ducking or gating occurs and OPEN sets how fast the audio gets un-ducked or un-gated as the audio level goes past the THESH setting.

The DEPTH control sets whether the audio is ducked or gated as the audio level drops past the THRESH setting. At 0.0 dB no ducking or gating of the audio occurs. Settings from 10 – 25 dB cause the signal level to duck. Higher settings, 25 - 40 dB, create a virtual audio gate to silence the audio once its level drops below the THRESH setting.

As with the Compressor, setting the controls toward the end of their ranges will make the ducking and gating more audible. For gating of unused mics in a talk studio, you'll want to adjust the THRESH so that the mics don't open when other active mics are being used in the studio, but will still quickly un-gate when someone handles the mic or begins talking into it. Typically, slower HANG and CLOSE times are used so the gating does not occur, during a breath or a normal speech pause, while a faster OPEN setting ensures the audio is not "upcut" when the mic is first used.

DMX APPLICATIONS

The DMX console is most often used in an air studio to control the audio going to a transmitter and/or streaming to the Internet. In almost all cases, the PGM 1 bus is used to feed the air chain and hence has the air signal. PGM 2 can simultaneously be used to create a different console mix for a syndication feed, to feed a recorder or a mic skimmer, or to go to a line output for a temporary video camera or personal recorder.

When the console is used in an air studio, and there is no talk studio associated with the console, the Studio monitor controls can be "repurposed" for other uses. One typical use is to control the monitor source feeding the guest headphones in the control room to allow the board operator to change their own monitoring source without affecting the guests' headphone feed. In this case the studio monitor output would feed the guest headphones either through Talent Stations (Figure 4-15) or a headphone amp system. The studio monitor output would be set to a fixed level (the Studio Monitor level control would be inactive) but the studio monitor controls would still be used to select the monitor source for the guest headphones. This allows the board operator to freely switch between control room monitor sources without affecting the audio going to the guest headphones.

the guest headphones. It also gives the board operator the ability to talk into the guest headphones using the TB (studio talkback) button.

The Studio monitor output could alternately connect to a newsroom or to a sports bullpen that does not have a console, but which goes live to air. The mics in that room would be set as "studio mics," so they mute the studio monitor output while on. Their monitor source would typically be "Pre-Delay." The board operator can then talk to the talent in the newsroom or sports studio using the TB button. If studio monitor speakers are not required, then the studio output could be used to feed a headphone amp. In this case the mics would not be set as studio mics so the Studio output would not mute.

Network Origination

Flagship stations for sports teams often need to have a second output from their main air signal to function as a regional sports network feed. This output is typically identical to their broadcast signal except it does not have local commercial spots and liners. It may also require adding special signal tones or other logic.

Creating this secondary network is easily done by using PGM 1 as your main broadcast output and PGM 2 or PGM 3 as your network feed. As long as the media server channels are setup to consolidate local spots and station liners on particular channels, then those faders can be unassigned from PGM 2 or PGM 3, whereas the national spots playback fader(s) and the game liners and the play-by-play remote inputs would be assigned to both PGM buses.

Production Usage

In a production studio, PGM 1 is typically the main record signal for an in-room PC running Pro Tools®, Audition®, VoxPro®, or other digital editing system. If the Wheatstone WNIP audio driver is installed on that PC, and that PC is connected to the Mix Engine's Ethernet switch, no analog or digital audio connection is required since the audio would connect over Ethernet for both recording and playback. WNIP audio drivers are available to support play and record of one stereo channel up to twenty-four channels of stereo playback and stereo record.

Voice Tracking

Using the DMX to do voice tracking is easily done in a production room where the mic channel would be assigned to both PGM 1 and PGM 2. No other inputs on the console would be assigned to PGM 1, which connects to the recorder. The channel (or channels) with track playback are assigned only to PGM 2. The talent then monitors PGM 2 to hear both the playback track(s) and their mic.

When voice tracking is done on an on-air console, PGM 2 and PGM 3 would be used to accomplish the same functionality as in a Production room since PGM 1 is feeding air. It's recommended that the talent mic be assigned to a second "voice tracking mic" fader, which is only assigned to PGM 2 and PGM 3. No other channels should be assigned to PGM 2, which is the voice tracking feed to the recorder. The playback audio channel(s) would be assigned to PGM 3. The talent then monitors PGM 3 to hear track playback and their mic. If they need to go live to air while voice tracking, they would use the normal board op mic channel, which would remain assigned to the PGM 1 air feed.

Callers and Remotes

Basic caller and remote operations were covered in the *Caller/ Remote Operation* section on page 47. This section presents specific settings for accomplishing tasks like answering the station hot line on the caller channel to take a song request or give the caller the bad news they are not the contest winner; to recording the caller for later broadcast because they are the contest winner; and, in the case of a talk show, to take the caller live-to-air. These are also applicable to remote channels, although for the most part remotes are used to go live-to-air, but they might also be recorded for later rebroadcast.

If the callers will not go live-to-air the caller channel's **PGM 1** button should be unassigned. The caller channel's **Cue** button should be lit so the board operator can hear the caller in the cue speakers and in their headphones. The board operator mic should be assigned to the PGM4/OL bus (no other channel should be assigned to PGM 4/OL) so they can carry on a hands-free conversation.

Recording Callers

If the caller will be recorded, we recommend using headphones and turning the cue speaker level fully down, otherwise the board operator's mic record will likely pick up the caller's audio as well.

Since the DMX does not have a dedicated call record bus like the EMX and other more expensive console, you must get creative in how to connect a call recorder since you want the host mic on one channel and

the caller on the other channel. The easiest method to do this is to dedicate PGM 3 for call recording.

To use the "PGM 3 method" you'll want the host mic on a second fader channel, so the original channel is still available to feed air. Typically, the mic is also assigned to channel 7 (or 15) and the phone is assigned to channel 8 (or 16). Assign the mic and phone channels only to PGM 3—making sure no other channels are assigned to PGM 3. Use **Navigator** to connect PGM 3 to the call recorder output. Use the Advanced Channel Feature **Pan** to pan the mic channel fully to the left channel and pan the phone channel fully to the right channel. The caller audio is now separated from the talent audio and each channel of the recording can be individually edited on the call recorder.

The advantage of using the "PGM 3 method" is that it allows the call recorder to connect via Ethernet, using WNIP drivers, or by using any stereo analog or digital output. It also means the call recorder can easily be set to record stereo programming. These "Telco Record" channel sources and pan settings can be saved as an Event to quickly reset the console for call recording by recalling that Event.

If you don't have a spare channel for a second mic, and are using an analog phone hybrid, then you could use two Y cables, one on the phone hybrid and the other on the console output that connects to the phone hybrid. One channel will be the caller audio while the other will be the mix-minus going back to the caller (e.g., the talent mic audio). If the call recorder's analog input is not balanced, a balanced-to-unbalanced balun, or a matchbox, will need to be used.

Going Live-to-Air

When a caller or remote will go live-to-air, their **PGM 1** and **Cue** buttons should be assigned. When their channel is off the caller/remote will hear the Off Line bus (any channel assigned to PGM4/OL minus their own channel). Typically, only the board operator mic is assigned to PGM 4/OL, but you may need a producer mic assigned as well. This allows the board operator (and producer) to talk with the caller/remote to prepare them for going live-to-air.

When the caller/remote channel is turned on, their mix-minus audio switches so they hear everything assigned to PGM 1 (minus their own audio) so they can interact accordingly. If the board operator needs to talk to the caller/remote while they're on-air, they press the momentary **TB** button on the caller/remote channel to give them cues (a break is coming up, etc.). This action interrupts the return audio so using TB while live should be used sparingly, and certainly not while the caller or remote is talking.

RAZOR I/O INTERFACE

Razor I/O Interfaces are 1RU rack mount devices installed in the studio and/or TOC (Technical Operations Center) to connect additional peripheral equipment with the DMX console and other devices on the WNIP network. Each Razor has eight stereo/16 mono inputs and eight stereo/16 mono outputs. A Razor is often used to interconnect satellite receivers, tuners, phone hybrids, codecs, internet streamers, air chain processor, and recorders with the DMX console.

Their input signals often appear as sources on DMX fader channels while their outputs may be connected to console PGM buses or to channel bus-minus signals. If you're checking for levels, engineering should have supplied a list of the input and output signals on each Razor so you can confirm whether a specific signal is present since that is the biggest use for the Razor front panel display by a board operator.

The Razor's front panel has the same type OLED display and large knob rotary encoder as used on the DMX fader channels. Rotate the encoder to switch the display between four screens: Input Levels, Output Levels, and two screens displaying technical details on that Razor (name, ID#, IP address, sample rate, MAC address, software revision, and hardware revision). The four screens are shown in Figure 4-16.

The two screens of interest to board operators are the Inputs and Outputs screens. Unlike the DMX console meters these displays only show average levels using vertical bar graphs since they are mainly to confirm there is a signal present and its level appears "normal."

The Inputs display, in Figure 4-16, shows normal signal levels where all the green and a few yellow segments are lit up. Three inputs (3, 4, and 7) have no audio. The Outputs display shows a test tone, set for the maximum signal level, being fed to all eight stereo outputs which lights up all meter segments. In practice, both Inputs and Outputs levels would appear like the levels shown in the Inputs display.
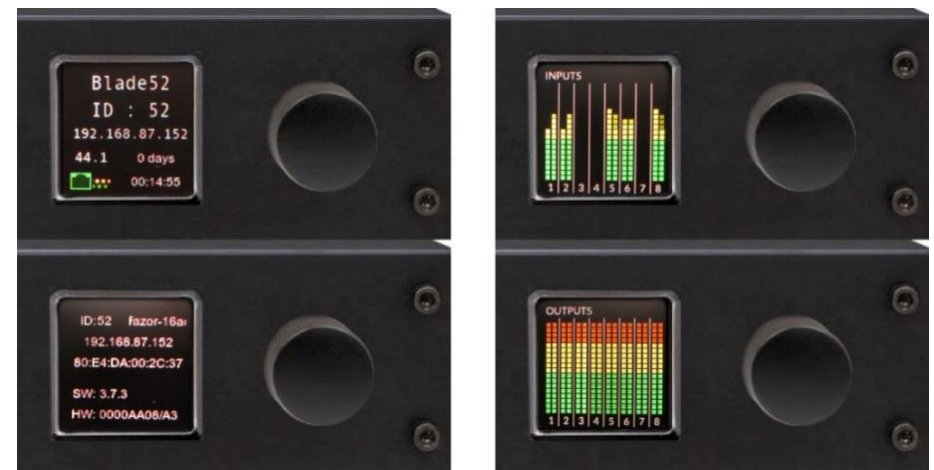

Figure 4-16 Razor Front Panel Displays

A ll DMX consoles are designed to yield many years of trouble-free 24 / 7 operation, which is why there's no power switch on the DMX Surface, Mix Engine, Razor I/O Interface, or M4IP-USB Blade. If any DMX system component does require service, this section covers how to obtain service help, technical documentation, and replacement parts.

PARTS AND REPAIR SERVICES

There are only a handful of field-replaceable parts on the DMX console, each of which is listed in this section. Most circuit boards and sub-assemblies are not readily field-serviceable due to the extensive use of surface-mount components and switching power supplies. It is recommended that the Mix Engine and Razor be returned to Wheatstone for repair. The DMX Surface does have some field replaceable parts.

DMX technical information (User Manual, Quick Guide, software revision information, wiring diagrams, application notes, and service bulletins) are always available for downloading from the Wheatstone web site: www.Wheatstone.com. Technical documentation is available in PDF files so Acrobat Reader 6.0 or later is required.

Parts Ordering and Repair Services

Replacement parts can be purchased through your Audioarts dealer or by calling Wheatstone/Audioarts support at 252.638.7000 (New Bern, North Carolina, east coast USA time zone) or by sending an email to: techsupport@wheatstone.com.

To expedite part ordering, and to ensure the correct parts are ordered, use the Wheatstone part number when ordering. Some parts and assemblies may have long lead times, so order spares accordingly.

Any component or part returned to Wheatstone for service, exchange, or credit must have an RA (Return Authorization) tracking number issued prior to their return. Items received without an RA number written on the shipping label side of the packaging may be delayed and subject to additional handling fees.

To contact the Wheatstone/ Technical Support department, to request an RA number or for installation and other technical support for the DMX console, call 252.638.7000 (8:30–5:30, east coast time) or send an email to: techsupport@wheatstone.com.

DMX Parts

Wheatstone #	Description or Use
007491	FSI-DMX/EMX (DC Power Coupler for redundant powering of any DMX Surface – also requires a 980064 In-Line DC Supply to supply redundant power)
007505	DC Cable (16-foot, for DMX-8 Surface)
041390	Control Panel Subassembly for DMX-8
041391	Control Panel Subassembly for DMX-16
041394	Complete DMX-8 console (Mix Engine & Surface)
041395	Complete DMX-16 console (Mix Engine & Surface)
041396	DMX-8 expander (separate 8-channel Surface)
044300	Razor 16A with Analog I/O and two mic preamps
044301	Razor 16D with all AES I/O
044302	Razor 16AD with half Analog and half AES I/O
044303	Mix Engine
250157	Control Surface Ribbon Cable
260005	TRS Headphone Jack (soldered part)
520149	Black Rotary Encoder Knob
520154P	Fader Knob
530004	Large White Button Cap (On/Off, Soft, Timer, TB)
530378	Small White Button Cap (bus assign, cue, TB, etc.)
540043	Channel Fader (soldered part)
560002	Rotary Encoder (soldered part)
610029	Plug-in OLED Display
850088P	LN-21 Hex Driver (1/16") for control panel screws
980064	In-Line DC Supply (used with the DMX-16 Surface)

DMX CONSOLE SERVICE

The DMX console contains two primary assemblies: the Mix Engine, which has no field-serviceable parts; and the DMX Surface, which has one assembly, its Control Panel, which can be replaced and possibly serviced in the field.

The optional Razor I/O Interface, like the Mix Engine, is not field-serviceable and should be returned to Wheatstone if service is required.

The DMX Surface can be powered down without affecting the Mix Engine's performance although in most cases this is more trouble than it is worth, so it is best to bypass the DMX console if the control panel must be

serviced. The button settings are maintained when the DMX Surface is powered down and the Mix Engine will continue to deliver audio. When the Surface is powered up after a replacement control panel is plugged in, all fader positions will update. So, if the console is active, you must make sure the new control panel faders are set to similar positions as on the replaced panel, otherwise there could be large changes in volume when the new control panel powers up.

The board operator headphone jack can also be replaced in the field. It screws into a threaded hole in the lower chassis. The control panel must be removed to access the headphone jack. Use an adjustable wrench to turn the square plastic jack housing to loosen it then hand unscrew the jack. Be sure to use shrink tubing over the solder joints on the new jack.

The headphone cable plugs into a keyed 3-terminal Phoenix connector (HDPN) on the network interface board so it can be unplugged when removing and installing a new jack onto the cable.

Tools Required

A standard #1 Phillips screwdriver is used to remove and replace the three screws holding the rear cover panel on the meter bridge. The hex head screws, which fasten the control surface, require a 1/16" hex driver. A very small flat blade screwdriver (like a "Greenie") is needed to adjust the mic gain trim pots or to flip the phantom power switches on the mic preamps.

If you are making up your own audio cables, an RJ45 crimper is required (and lots of RJ45 plugs). Having a Category cable checker with remote test plug, so that already run cables can be easily checked in situ, is also a must.

Mix Engine Status lights

If the red ERROR LED lights up on the front of the Mix Engine, it indicates a fault in the Mix Engine's operation. Although audio may still be passing through the Mix Engine and there may be no outward sign of trouble, the error indicator is saying otherwise.

To clear the fault, try rebooting the Engine using **Navigator** (right-click on the Mix Engine icon in the System Dock and select *Reboot Blade*). If the Mix Engine reboots and the Error LED turns off, then the issue was resolved.

If the Mix Engine reboots and there is no change to the Error LED, the Mix Engine will have to be power cycled. This will cut off all audio through the device so it will have to be bypassed before power cycling it. Unplug its AC cord and wait a minimum of ten seconds, to ensure power is fully removed from all internal circuits, before plugging the AC cord back in.

The Ethernet connectors for network connection have two integral green LEDs. Both blink to indicate Gigabit operation. If only one is blinking, then that connection is working at Megabit speeds. This is OK for the DMX Surface and for an admin PC which only has only one or two stereo signals going over its Ethernet connections.

Swapping the Control Panel

The Surface's control panel can be swapped while the console is on-air since audio flows through the Mix Engine not the Surface. Of course, you have no control over the audio while the Surface is off line, but it should take less than five minutes to swap the control panel.

To swap the DMX Surface control panel:

1. Unplug the DC power to the Surface. This can be done by unplugging the DC connector on the network interface board (see Figure 2-2 on page 11) or, on a DMX-8 Surface, by unplugging its DC cable at the Mix Engine. On a DMX-16 Surface, unplug the AC cord on its power supply.

2. Use a 1/16" hex driver to remove the hex screws from around the Control Panel (12 on a DMX-8, 18 on a DMX-16).

3. Lift up the front edge of the control panel to unplug the keyed ribbon cable(s) that connect the control panel to the network interface board. There is one cable on a DMX-8, two cables on a DMX-16.

4. If the control panel is being replaced "hot" make sure the faders on the replacement control panel are set to the same positions as on the original control panel. This is not important if the console is taken off-air, the faders can be set to full off.

5. Set the replacement control panel onto the rear support rail and plug in the keyed ribbon cable or cables.

6. Set the control panel into place on the chassis and fasten it to the chassis using the hex screws removed in step 2.

7. Plug in the DC cable to power up the Surface.

The new control panel will take about a minute to boot up. The same audio sources, assignment button settings, and monitor settings as the original panel will appear on the replacement panel. If the faders were set as on the original panel, and the DMX console has continued playing on air, there will be momentary audio level changes as the new Surface takes control (especially if EQ or Dynamics are active since there will be a couple seconds where the audio switches to flat then switches back to the EQ and Dynamics settings for any channel that is live).

APPENDIX A – CREATING A WNIP NETWORK

A stand-alone DMX console can be networked with up to three other WNIP-compatible devices (PC or audio server, Razor I/O Interface, Blade, talent station, etc.) using the five-port gigabit switch in the Mix Engine. To network additional WheatNet-IP (WNIP) devices or if you want to network your DMX with additional WNIP consoles, one or more Wheatstone-approved gigabit Ethernet switches must be used to support the additional audio streams propagated over the WNIP network.

MIX ENGINE ETHERNET SWITCH

Inside the Mix Engine is a Netgear GS105Ev2 5-port gigabit Ethernet switch. At the factory it's configured for stand-alone operation so if the DMX will not connect to an external switch you don't need to edit any configuration settings. But, when the DMX will be networked with other WNIP devices, which means it will connect to another gigabit switch, the Netgear configuration settings must be edited to properly stream audio between the built-in switch and the external WNIP system switch.

Editing the configuration is done using the Netgear ProSafe Plus Utility, v2.7.2 or later. It can be downloaded from Netgear's web page (Netgear ProSafe Plus link) and installed on the PC running Navigator and the DMX Surface Setup apps.

When the ProSafe Plus Utility starts up it searches for and displays any Netgear switches it finds. The default IP for every Mix Engine Netgear switch, as set at the Wheatstone factory, is 192.168.87.239. When a switch is selected and *Apply* is clicked, a log-in window appears (Figure A-1). The default password is *password*.

After entering the password, the *System > Switch Status* page is displayed. Click on System > *Multicast* then click on *IGMP Snooping* to show the **IGMP Snooping Configuration**.

Figure A-2 shows the settings when the Mix Engine switch will connect to a managed WNIP system gigabit Ethernet switch. The *IGMP Snooping Status* is the only setting that will need to be changed. On a stand-alone console, **Disable** is checked. When the Mix Engine's built-in Ethernet switch will be networked with a managed 1GB switch, the *IGMP Snooping Status* must be set to **Enable.** The IGMP Snooping Static Router Port should already be assigned to 01 (Port 1 on the Mix Engine switch). Connect Port 1 to a managed switch port which is configured as a **Trunk Port**.
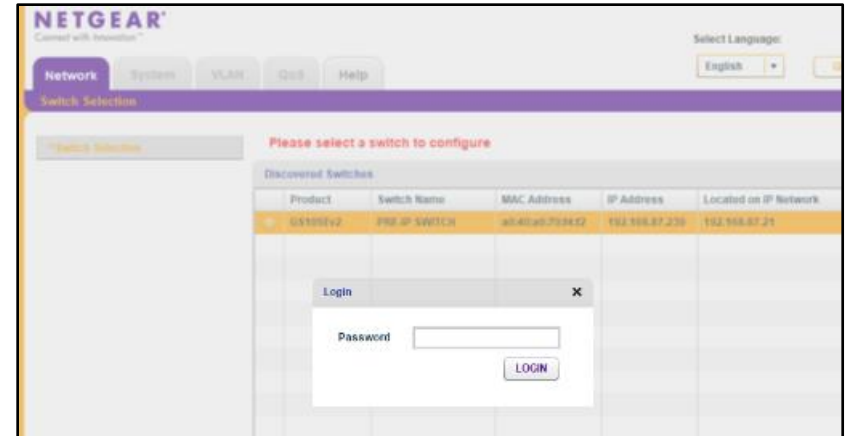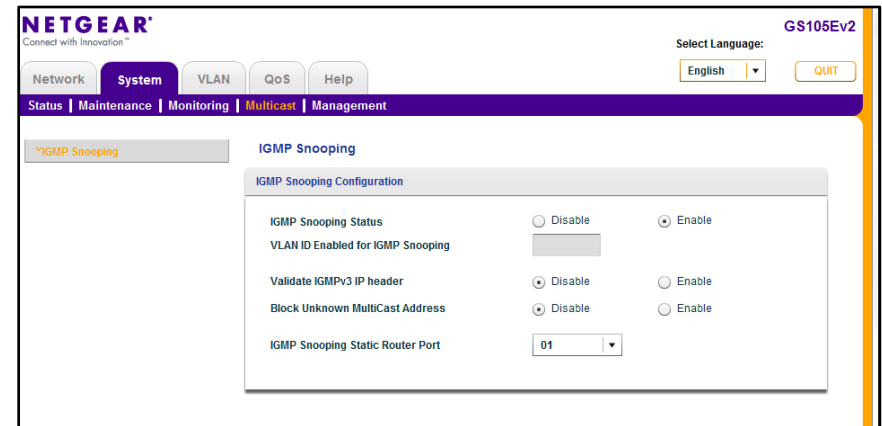

Figure A-1 Netgear Login Page

Figure A-2 Netgear Switch System Management Page

Keeping Track of Your IP Addresses

The default IP addresses that "factory-fresh" DMX consoles and Razors use should be reserved, allowing additional new devices to be plugged into the network, without causing an IP addressing conflict, so their settings can be changed using the Navigator Locator tab. Here are the default IP addresses assigned to new products:

192.167.87.50 (default Razor-16A)
192.167.87.60 (default Razor-16D)
192.167.87.70 (default Razor 16-AD
192.168.87.101 (default Mix Engine and other Blades)
192.168.87.201 (default DMX and other Surfaces)

It is recommended that a system-wide IP address table be created, whether using an Excel spreadsheet or in a handwritten list. This list must

include every device connected to your WNIP network: Mix Engines, Surfaces, Razors, Blades, PCs, audio servers, talent stations, selector panels, etc. Every device must be assigned a unique IP address since a WNIP network, like every AoIP network, does not support DHCP.

Navigator's Locator tab (Figure A-3), is used to select one device to edit its properties to assign a new IP address, device name, host, and Device ID for Blades. Since changing these settings can affect the default signal names for the device, you'll want to edit these settings prior to editing the signal names. To use the Locator tab, connect the new device to the WNIP system switch. Once it is listed (may need to click *Refresh*) click on the new device to highlight its row (a Mix Engine is highlighted in Figure A-3) and show its properties in the Set Selected Device Properties pane. In the Properties section the assigned IP address, Name, and for Surfaces and Razors, the Host Data (Host IP address) can be edited. For the Mix Engine, Razors and Blades, the assigned Device ID Number can be edited in the Details section. After editing click *Apply* to update the device. For most settings the device must be rebooted to use those settings, so click *Reboot* when your editing is finished to restart that device and to then use the new settings.
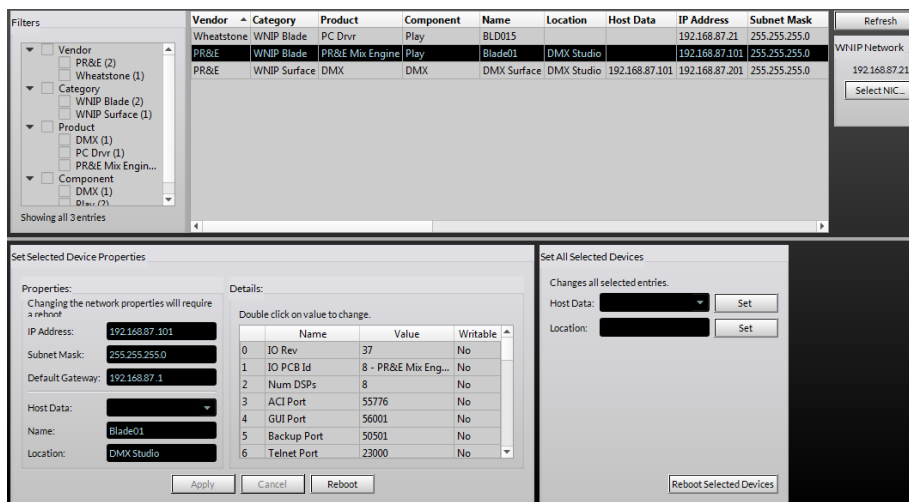

Figure A-3 Setting Device Properties in the Locator Tab

Typically, the IP address and ID# for each device are related. For example, setting a Blade to ID9 means its IP address is typically set for 192.168.87.109. If it's a console Blade or a Mix Engine, its Surface IP is typically related (for Blade 9, it would be 192.168.87.209). Razors and non-console Blades can be set for sequential ID numbers and IP addresses, like Blade ID51 would use IP address 192.168.87.151. Blades are typically sequentially numbered up to ID99 and IP address 192.168.87.199, skipping over the default addresses.

Media servers and PCs are typically assigned IP addresses starting at 192.168.87.100 and moving down, reserving 192.168.87.21 for the PC running Navigator and the DMX Setup app. Ethernet core and edge switches (talked about in the Multi-Station Expansion section) are typically assigned IPs from 192.168.87.1 up to 192.168.87.20. Talent stations and other accessories would be assigned IP addresses above the switches and below the PCs and servers (e.g., in the .30 to .70 range).

⚠️ **Note:** On very large systems, with more than about 30 consoles, the IP addresses assigned to the Mix Engine's internal Ethernet switches should not use the .240 to .254 range. Rather they should be assigned along with the AoIP switches, using the .1 up .20 range or set to .22 and above (assuming .21 is assigned to the PC running Navigator and the DMX Setup app).

WNIP NETWORK EXPANSION

Here's an overview of what's involved in creating a WNIP network, starting with one stand-alone DMX console and adding one or more Gigabit Ethernet switches configured for WNIP devices.

Ethernet network switches which can be configured for multicast audio streaming are generically called AoIP (Audio over Internet Protocol) switches to differentiate them from a facility's Ethernet or LAN switches used to network the facility PCs, servers, and printers. AoIP switches and the facility's Ethernet switches may be the same model since it's the switch configuration settings which set whether a switch is suitable for AoIP or regular Ethernet traffic. Thus, the AoIP switch definition is arbitrary and only refers to a switch that can be specifically configured for multicast audio streaming.

For most installations this means using separate switches to "air-gap" traffic on the AoIP network from the facility's Ethernet network. One could use one or more large Ethernet switches, configured into multiple VLANs or virtual networks to isolate the AoIP streaming audio traffic from the facility's Ethernet traffic, but creating VLANs is not covered in this manual since we whole-heartedly recommend using separate AoIP switches to create your WNIP network. Doing this simplifies switch configuration and makes network troubleshooting a whole lot easier.

Creating a Small WNIP Network

Once the built-in network switch in the Mix Engine has five devices plugged into it, the only way to add additional WNIP devices is to add a Wheatstone-recommended AoIP switch and connect the built-in Mix Engine switch (after setting the switch up for IGMP, as covered on page 61) from Port 1 to a Trunk Port on an AoIP switch.

Various Ethernet switches from Cisco and HP have been used in WNIP systems over the years, but their model numbers change on a regular basis, so it's best to visit the Wheatstone web site (click on Support &

Downloads then select Compatible switches for WheatNet-IP) or else call or email Wheatstone tech support for recommended switches.

One current Cisco switch (as of March 2020) that we recommend is the 2960-series of layer 3 managed switches. The 2960CX-8TC-L eight port switch can be used as a studio edge switch or even as a core switch for a small system. For larger systems, the 2960X-24 twenty-four port switch can be used as an edge switch to combine multiple studios together so one CAT6 cable can be run back to the Technical Operations Center (TOC), or that model can serve as the WNIP system core switches to connect various smaller edge switches with the Blades and other networked equipment in the TOC. A configuration sheet on these switches can be downloaded from the Wheatstone web page: compatible-switches-for-wheatnet-ip.

For a single station facility, with two DMX consoles in an on-air studio and a production room, along with several Razor I/O Interfaces and two audio servers, a small eight-port switch may be all that you need. Two in-room WNIP devices (Razor I/O Interface, M4IP-USB Blade, Talent Station, VoxPro PC, or audio server) can plug into the built-in switch in each studio, using Ports 2 and 3, reserving Port 1 on each Mix Engine to connect to the main AoIP switch, typically located in the TOC.

> ⚠️ **Note:** PCs and audio servers must be running the WNIP audio driver to play and record audio over their network connection. Audio drivers, to support from one up to twenty-four stereo channels of playback and recording, can be purchased through any authorized Wheatstone or Audioarts dealer.

An eight-port or larger AoIP switch is typically located in the TOC along with multiple Razor I/O Interfaces and audio playback servers. It takes a single CAT6 cable, from Port 1 on each Mix Engine, to connect each studio to a port on the system's AoIP switch. The Razor Blades and audio servers in TOC then connect to other ports on the main AoIP switch, also using one CAT6 cable each.

If the on-air studio has a separate talk studio, you'd typically add a small AoIP switch in that studio to network that studio's WNIP devices and to connect that studio to the main switch. If there are four mics in the talk studio, an M4IP-USB Blade could be installed since it has four mic preamps along with four USB ports for connecting laptops for playback or recording. If a Talent Station is used at each mic position, for mic control and to add a headphone jack, then an eight-port switch could be used in that room.

Since Talent Stations can be powered by POE (Power-Over-Ethernet) using a switch that supports POE is recommended for talk studios since that means the talent stations only need a single CAT5 cable connected to them—no wall-wart supply required.

Multi-Station Network Expansion

When two or more stations share a single facility, we recommend you follow the small WNIP network expansion model for each station where that station's studios connect to one "Edge Switch" typically located in that station's main on-air studio. Each station's main edge switch then connects to a "Core Network Switch" located in the central rack room/TOC. Depending upon how many stations, and how much TOC equipment is being connected, the Core Network Switch might physically consist of a couple medium-sized (24-port) network switches rather than a single large 48- or 96-port switch. Standardizing on one size or type of switch means you'll only need one type of on-the-shelf backup switch.

If a multiple station facility is being planned, Wheatstone offers system configuration and system programming to create salvos, scripting for programmable buttons, etc. These engineering services are charged on a per-studio or on a per-hour basis. Other services, including factory proof of performance as well as on-site commissioning and training are also available. These services can all be arranged through your dealer or directly thru Wheatstone sales.

Wiring Practices

Since most studio wiring is now using straight-thru four-pair category cables (i.e., CAT5, CAT5e, CAT6), we recommend taking advantage of the various category cable jacket colors that are available to differentiate the cables carrying your various system signals. This not only simplifies installation; it ensures future system troubleshooting will also be easier.

Here are recommended cable jacket colors by type of system signal:

Orange	Blade-to-Ethernet switch port cables
Green	PC & Media servers-to-Ethernet switch port cables
Yellow	KVM-over-IP cables
Blue	Facility IT Ethernet cables (since they're probably already in place and are probably blue!)
White	IP phone system cables
Black	Audio and logic wiring (Blade I/O to & from peripheral audio and logic devices)

Most users have also standardized on an automation server company—most of whom offer WNIP support for SLIO (Software logic I/O). The automation servers are typically located in the TOC since it's climate controlled and server noise is not an issue. KVM IP extenders are available from various vendors, like ADDERLink (https://us.adder.com/en/kvm-solutions/extenders), which allow a single category cable to directly connect a server to a studio-located monitor, keyboard, and mouse over cable runs of up to 160 feet (48 meters).

Signal Connection Control

Most users have several types of codecs which may be shared between studios or even between different stations in a cluster. These codecs might include older ISDN interfaces along with newer Tieline Merlins and Comrex Accesses, but no matter what type codec you use, the WheatNet *Associated Connections* feature can be used to automatically connect a mix-minus signal to each codec when it's taken on a console to simplify connecting your codecs.

The downside of doing it this way with shared codecs is that this can lead to a user changing the return feed to a codec that's still actively being used. To prevent this from occurring, many users opt to force codec users to physically go to a rack selector or to a touchscreen, often mounted in a hallway outside TOC, where they must identify whether a codec they want to use is actively being used, and if not, to then connect the codec for their use.

This "Public Codec Rack" is typically setup with a touchscreen monitor running ScreenBuilder (a Wheatstone app configured using a GUI interface) that is setup so that a user can easily switch codec routing without the need to use Navigator's Crosspoint grid or to fire off a system salvo or use Associated Connections to switch the return connections for the shared codecs.

The ScreenBuilder app is a very powerful tool that can be licensed to run on multiple PCs. The app uses standardized on-screen elements (faders, meters, labels, buttons, clocks, timers, and other widgets) to physically control WNIP network devices. Arranging these on a PC screen allows one to create custom control panels, and quick-access buttons to monitor and control codecs, for setting up recorder feeds, and for controlling the sources going to the Internet streams.